Products finishing

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CONTENTS

Lithographing the Tin Can 9
By GEORGE E. MONROE, JR.

Records for Finishing Materials 14
By WILLARD SEEMAN

Electrodeposition of Nickel from Nickel Chloride Solutions 18
By W. A. WESLEY and J. W. CAREY

Barrel Finishing of Metal Products 36
By H. LEROY BEAVER

Metal Coloring Theory and Practice—Part III 46
By JOSEPH B. KUSHNER

The Finishing Forum 52

News of the Industry 56

Finishes That Aid in Appearance and Utility 62

New Plant Equipment and Materials 64

Opportunity Section 77

For Your Catalog Library 78

Index to Advertisements 80

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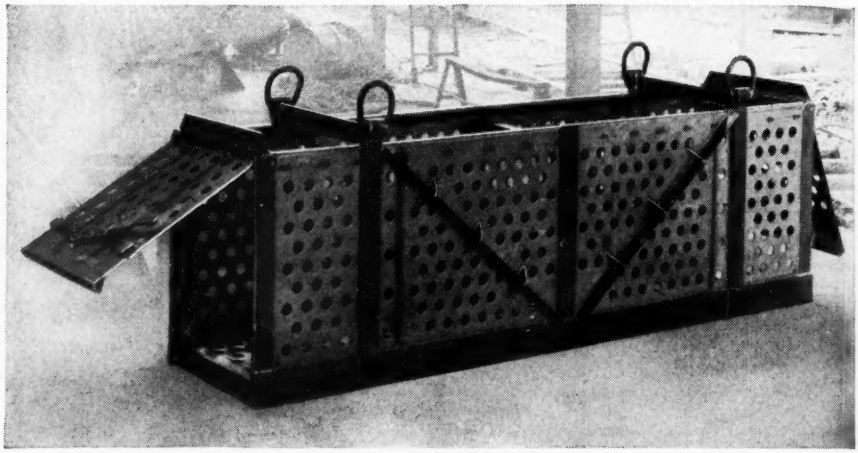

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PRODUCTS finishing

CINCINNATI, OHIO VOL. 4, NO. 6

MARCH, 1940

LITHOGRAPHING THE TIN CAN

By GEORGE E. MONROE, JR.

THE odd fact about a tin can is that it is not tin, but 98 per cent iron, or steel which is 99 per cent pure iron. During the fabrication of the tin can, thin steel sheets, called base plates, are carried mechanically between rollers in a bath solution of molten tin. The bath is divided into two sections: In the first, the sheets are cleaned so they will pick up the layer of flux, and in the second, a film of pure palm oil is applied. The oil prevents oxidation and tarnishing from exposure to oxygen in the air. After the molten tin bath, the sheets are passed through a cleaning process where the oil is removed and the surface polished. Cleaning is done by absorbents consisting essentially of wheat or rye bran. It is at this stage that the first step is taken in preparing the base sheets for lithographing. The sheets must be free of imperfections and practically free of oil.

Of the two commercial grades of tin plate—"coke" and "charcoal"—the latter is the best suited to lithograph work. Coke plates, bearing 1.35 pounds of tin covering a total area of 62,720 sq. in., or sizing one side only an area of 31,360 sq. in., will not take as good a job as heavy charcoal treated plate carrying two pounds or more of tin for the same surface area. This is particularly true if the coke plate contains flow lines, feathering, frost finish or other irregularities caused by surface crystallation. Charcoal plates are used wherever acid foods are to be canned.

Care must be taken to have the working plates clean. Cleaning is done by a vacuum process, where sheets are passed through cloth rolls, and if the palm oil has not then been entirely removed they may have to be treated chemically.

Once the lithographing job has been started the individual processes are all automatic. The American Can Company's Englewood plant in Chicago—one of the largest plants in the world devoted to the fabrication and finishing of tin can—is also one of the most efficiently equipped

plants.

Plates are picked up by suction cups and pushed between rollers where a coating of lacquer is applied to the side that is later fabricated into the inside of a can. The lacquer used is much like shellac and is applied to prevent reactions of acids on the metal. There are a number of kinds of lacquers used for this purpose, and the kind applied is dependent on the service in which the can is to be used. Some lacquers prevent bleaching of red fruits, others prevent discoloration of vegetables or meats, while beer cans are coated to preserve the flavor. Oil cans are not lacquered.

After the lacquer has been applied, a chain belt carries the sheet along a wicket-rack in a semi-upright position through a 90-ft. oven where it is baked at an even temperature of 448 degs. F. At the far end of the oven is an air cooler where the plates are stacked. Approximately 17 minutes is required for the baking and cooling process.

The sheet passes through the next stage if it is to be given a coating to support a background color. The coating is applied in the same manner as the lacquer.

Coating the sheet provides a neater looking finished job. For an example, a sheet to which is applied an aluminum coating can be considered. Instead of covering the entire surface, the rollers are stripped to leave solder margins, after which the aluminum is applied in four strips. As in the case when the sheet was lacquered, the sheet is passed through a baking oven. In this instance, however, the oven is but 60 ft. long in the top compartment and the lower space is 45 ft. long. Baking is at 330 degs. F., and the process takes 27 minutes.

After baking, the plate is ready to be lithographed. The design calls for red and blue colors. Where the two colors are not required to blend to form a third color, they can be applied on a two-color press in a single operation. If they are to blend to form a third color, then the first must be baked on before the second can be applied. For example: in blending gold with white, the gold over tin is still gold, but gold over white is yellow. Blue on red is black; blue on orange is black, and blue on white is light blue. As many as ten shadings have been made by using five basic colors by applying each separately and baking it on before the next step is taken.

As in the case with printing on paper, the two-color press uses two zinc printing plates, one for each color. Plates must be cut extremely accurate and carefully adjusted on the presses, otherwise the colors will not register. When used for lithographing, the etched zinc plates are not cut away into high and low points as when color printing is to be done on paper. Instead, they are roughened and sensitized by coating with an albumen and ammonium bichromate solution to which has been added a small amount of aqua ammonia. The design that is to be printed is photographed directly onto the zinc plate. Following exposure, the zinc plate is coated with a greasy liquid developing ink. Surplus ink is removed by washing.

The zinc plate is bent around the large plate cylinder of the rotary lithographic press, and prints on the tin plate are obtained on the principle that water and oil do not mix. In other words, the zinc plate revolving on the cylinder press is kept wet by being in contact with a water roller, but the water does not adhere to the exposed image to be printed due to its greasy surface. The greasy surface picks up the ink and prints,

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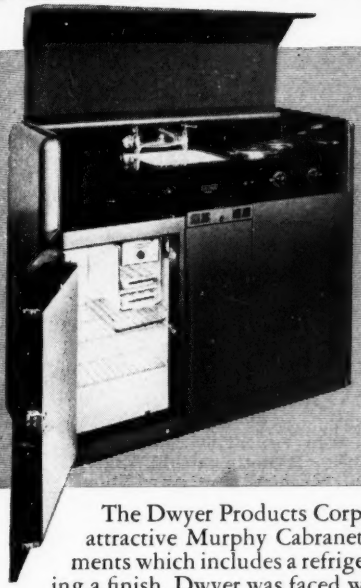

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but the greasy ink will not adhere to any portion of the zinc plate.

Designs for 20 cans can be printed at the same time. After printing, the tin plate is again conveyed into a baking oven. This baking time is shorter than the two previous ones. Baking is done at a temperature of between 310 and 315 degs. F. The plate travels down a 50-ft. line and returns on a lower level and through a cooler which is a distance of about 40 ft. and is again stacked. The time required for this is about 20 minutes. If another color were to be applied, the same operation would have to be carried through again on a single color press.

When the design is finished, a final varnish is applied for protection. Without varnishing, the design would peel when anything was rubbed against it. The varnish also brightens and gives gloss to the design.

The varnishing process is done on equipment similar to that which was used to apply the aluminum coat. The baking temperature is but 270 to 275 degs. F., and the trip through the oven and cooler takes 25 minutes.

Through efficiency and modern equipment it is possible to lithograph from 40 to 50 tin plates a minute. For a plate to pass through all the processes and operations described takes slightly more than an hour and a half. When the lithographing has been completed, the plates are moved into storage where they are held until requisitioned to be cut into blanks and sent through other departments to come out as tin cans.

Safe Handling of Acids and Chemicals. The Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn, N. Y., has just published a four-page folder entitled "Safe Handling of Acids and Chemicals" which is said to be of value to every plant where workers handle acids, chemicals, or caustics. The folder illustrates and describes a full line of specialized protective equipment, including aprons, gloves, sleeves, hoods, goggles, respirators, carboy truck and tilter, carboy siphon, acid pails and dippers, and so on.

A copy of "Safe Handling of Acids and Chemicals" will be sent free upon request.

Pylumin Process. A process for the protection of aluminum to be known as "Pylumin" is described in an eight-page booklet now being issued by Pyrene Manufacturing Company, 560 Belmont Ave., Newark, New Jersey.

This well illustrated booklet describes the simplicity and economy of installation and operation, its adaptability and flexibility. It discusses the use of the Pylumin Process as a corrosion-proof base for paint finishes or for the protection of unfinished aluminum parts. Instructions for the operation of the process are also included.

Copy free upon request.

Technical Bulletin on Codur High-Speed Synthetic Enamels. A Technical Data Bulletin on M&W Codur Enamels, high-speed synthetic finishes designed especially for high-grade products subjected to severe service conditions, has just been published by Maas & Waldstein Company, makers of industrial finishes, 438 Riverside Ave., Newark, N. J. The bulletin gives the information on the Codur line needed by the practical finisher, including specifications for finishing Bakelite products and for finishing steel cabinets and furniture. Copies will be sent free upon request.

Sarco Cooling Control Bulletin No. 197. A catalog covering temperature regulators and mixing valves of various types designed specifically for the control of water and brine is now being published by Sarco Company, Inc., 183 Madison Ave., New York, N. Y. This bulletin indicates the wide range of applications for these instruments.

All the controls listed are of the self-operated type, requiring no auxiliary powers such as compressed air, electricity, or water to operate them. All of the instruments use the Sarco liquid expansion system. Expansion of liquid is uniform per degree of temperature rise at all temperatures.

The thermostat plungers are sealed with Sarco helically corrugated flexible tubing.

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DEVILBISS

RECORDS FOR FINISHING MATERIALS

By Willard Seeman

IN every finishing department there is the need for some system of recording data on the purchase, test and control of the various organic finishing materials which are used. This is especially the case where a large variety of work is done and a number of different lacquers and enamels, each with its individual handling requirements, are applied. Certainly the many particulars of a manufacturing process as important as finishing should not be trusted to memory. Not only may mistakes occur, but changes in personnel may result in costly delays until the necessary information is located or redetermined. Furthermore, there is the importance of having collective facts and figures available for making cost comparisons or for estimating new jobs.

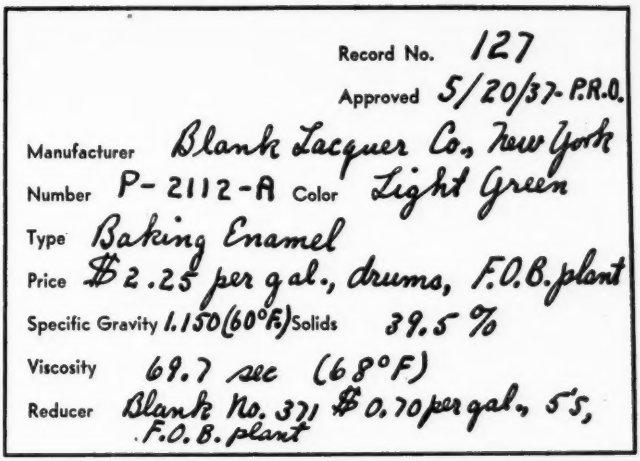
The subject of records for organic finishing materials is of interest to all finishing superintendents who are responsible for the numerous details on which trouble-free lacquering and enameling depends. In this article, the author discusses the importance of such records and describes the forms and data necessary for a practical system.

Data

The information essential to a working record of any organic finishing material falls into two separate, yet dependent, groups. The first group concerns itself with purchasing and testing and includes identification details, such as the name of the manufacturer, the number of the material, price, etc., and physical specifications such as color, viscosity, specific gravity. With this information, correct ordering is assured and, on delivery, the material may be checked against the original approved sample. It is understood, of course, that the checking of incoming goods in no way reflects on the manufacturer. The keynote of successful finishing is uniformity and checking is only part of the procedure of routine control which insures the use of the same material in the same way.

The second group of data applies to manufacturing procedure and, from the standpoint of production, is more important than the first. There are certain conditions for the application and processing of any particular finishing material which produce the best and most economical results and these are recorded in group two. For example, there are spraying pressures, the amount of reduction with

Fig. 1—Front side of sample data sheet with example information filled in.


Record No. 127
Approved 5/20/37-P.R.O.
Manufacturer Blank Lacquer Co., New York
Number P-2112-A Color Light Green
Type Baking Enamel
Price $2.25 per gal., drums, F.O.B. plant
Specific Gravity 1.150 (60°F.) Solids 39.5 %
Viscosity 69.7 sec (68°F)
Reducer Blank No. 371 $0.70 per gal., 5's, F.O.B. plant

thinner, baking or drying schedule, and similar data. If the correct material has been delivered to the finishing department and if these conditions are exactly and consistently followed, there should be no difficulty, either in the handling or the resulting finish.

A typical finishing material record form is illustrated in Figures 1 and 2. The form shown is mimeographed on filing cards of medium size and, for convenience, the two data groups are separated by using both sides of the card. Purchase and test information appears on the front side as shown in Fig. 1 and manufacturing details on the other as shown in Fig. 2.

General Considerations

The success of any system of records depends on its being inexpensively maintained and easily used. This applies to organic finishing material records. Individual sheets may be of any suitable paper in any convenient size. Ordinary note paper, punched for looseleaf binders, make serviceable records. Library cards are also suitable, particularly where it is desirable to carry them about during the working day. Mimeographing, or any of the usual office duplicating methods, may be used to print the forms. Forms may be modified

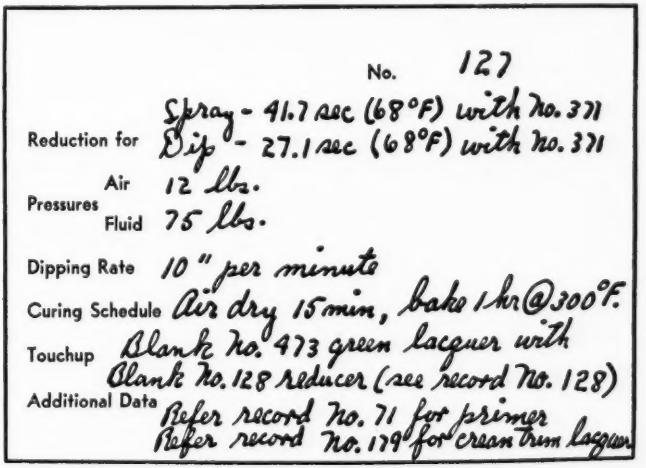

No. 127
Reduction for Spray - 41.7 sec (68°F) with No. 371
Dip - 27.1 sec (68°F) with No. 371
Pressures Air 12 lbs.
Fluid 75 lbs.
Dipping Rate 10" per minute
Curing Schedule Air dry 15 min., bake 1 hr @ 300°F.
Touchup Blank No. 473 green lacquer with Blank No. 128 reducer (see record No. 128)
Additional Data Refer record No. 71 for primer
Refer record No. 179 for cream trim lacquer

Fig. 2—Back side of sample data sheet with example information filled in.

in size, arrangement and content, depending on individual needs. It is not necessary that the data, the cross-references or the index be involved. Those facts which are essential should be kept and so arranged so as to be quickly available and easily understood.

The use of records in the finishing department will be found to save money, time and labor.

Goodrich Acidseal Paints. A four-page catalog section on its line of Acidseal Paints, derived from rubber by a process which it developed and patented, has just been issued by The B. F. Goodrich Company, Akron, Ohio.

The subject is interesting to industrial engineers because of the paint's unusual properties as protection for power plants, steam pipes and hot plates, building exteriors, concrete floors, filtration plants, conveyors, structural steel, boiler, fronts and boiler room walls, fans and blowers, boiled feed water tank lining and many other uses.

Acidseal paints, according to the manufacturer, are different from any other type of paint, lacquer, or coating, with strong adhesion, corrosion resistance and elasticity as characteristics. They dry by evaporation, during which the solid material is united to metal or any other clean, dry surface with practically an inseparable bond. They have many of the elastic properties of rubber, the hard, firm film conforming to the expansion, contraction or vibration of the painted surface without cracking.

The catalog section lists all properties of the product, directions for use, each type, with its special properties, and includes an exact reproduction of the different colors in which the paints are made.

A copy will be sent free upon request.

The Physical Examination of Metals. A 181-page book comprising Volume I and devoted to Optical Methods of "The Physical Examination of Metals" by Bruce Chalmers. Volume I is divided into six chapters. Chapter I is the Introduction, and Chapter II is devoted to Geometrical Optics, III and IV are devoted to Wave Optics with III describing Interference and IV, Diffraction.

Chapter V is devoted to Polarised Light and Chapter VI to Sources of Light. A number of illustrations are also included to aid the reader in visualizing many points brought out by the author.

The object of the book is to explain, in as simple language as possible, the physical theory underlying the methods of examining metals, to describe the more important applications that have been made, and, where possible, to describe the technique used so that the reader can apply it himself. In some instances it is not deemed practical to describe the technique in detail because specialized training is required for its application. Such methods are included, however, because a general understanding of them leads to a better appreciation of the value and limitations of the results.

A copy of "The Physical Examination of Metals" by Bruce Chalmers can be obtained at the price of $4.00 by writing to Longmans, Green & Company, Inc., 114 Fifth Ave., New York, New York. This book can also be obtained by writing to Edward Arnold & Co., London, England.

Rexvane Vent Sets Bulletin No. 406. Rexvane ready-to-run blowers for ventilating, air conditioning, and fume exhaust are described in this bulletin now being issued by B. F. Sturtevant Company, Hyde Park, Boston, Mass.

Bulletin No. 406 has illustrations of the variety of Rexvane Vent Sets which are now being manufactured by this company. Specification tables are also included.

A copy of this bulletin will be sent free upon request.

"Scientific Washroom Service" is the title of a new booklet which has just been released by the Scott Paper Company, Chester, Pennsylvania. The booklet, based on an intensive study of hundreds of industrial, public, and institutional washroom installations, offers a helpful advisory service which is available without cost to architects, executives, plant superintendents, and building managers.

The recommendations which the booklet contains will be definitely helpful in providing improved washroom service. Copy free upon request.

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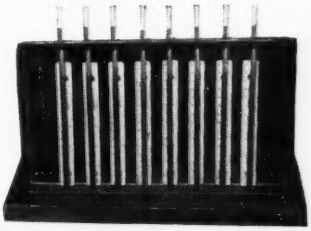

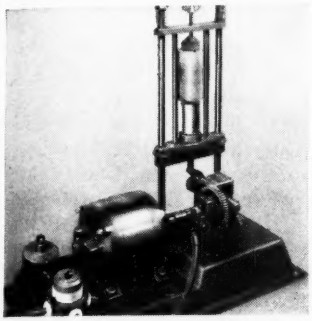

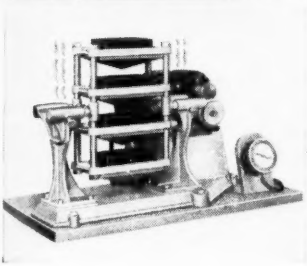

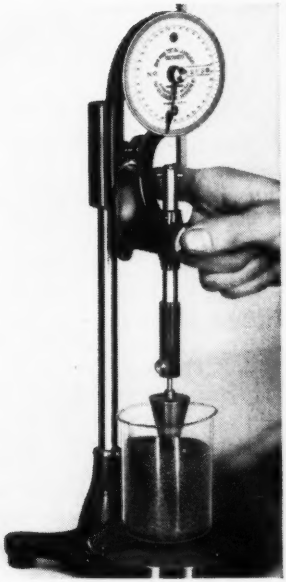

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ELECTRODEPOSITION OF NICKEL FROM NICKEL CHLORIDE SOLUTIONS

Part Two of a paper read Feb. 3rd before the Baltimore-Washington Branch of The American Electroplaters' Society. Published by special permission of The Electrochemical Society.

By W. A. WESLEY AND J. W. CAREY
Research Laboratory, The International Nickel Company, Inc.

Physical Properties of Deposits

Hardness and Tensile Tests. Deposits of 0.02 in. (0.5 mm.) thick were prepared for tensile tests. They were plated on an Inconel (80 per cent Ni, 13 per cent Cr, 6 per cent Fe alloy) cathode 16 cm. by 18.4 cm. in size, from which they were readily removed and cut into strips 2.5 cm. wide, the long dimension of the strips corresponding to the 16 cm. horizontal dimension of the original cathode. The strips were then machined according to the general form of the standard American Society for Testing Materials' sheet tensile specimens[5] but were only 6 in. (15.2 cm.) long. The reduced section was 0.500 in. (1.27 cm.) wide and 3 in. (7.6 cm.) long.

The strips cut from the lower part of the deposits were slightly thicker than the others and all individual specimens were slightly thinner at the center than at the edges. For this reason a thickness survey was made of each specimen and it was ruled into 8 arbitrary zones whose exact thickness was recorded. After the tensile test the zone of fracture was noted and the original recorded thickness at that zone was used in calculating the results of the test. A small tensile testing machine with a 2,000 lb. (907 kg.) range and American Society for Testing Materials' self-aligning grips were used.

Hardness measurements were made on the inner surfaces of portions of the deposits, that is, the faces originally in contact with the cathode. A Vickers machine was used with the diamond pyramid indenter, and the 10 kg. load.

The results of the tensile and hardness tests are shown in Table II. It is evident that the deposits from the chloride electrolyte are harder, stronger, and correspondingly less ductile than the soft nickel deposited from the sulfate bath. The ductility

[5] *Am. Soc. Testing Materials Designation, E8-36. Am. Soc. Testing Materials Standards (1936).*

of the matte deposits from the chloride bath, as indicated by the elongation values, is considerably higher than that reported by Blum and Kasper[6] for deposits made from boiling chloride solutions. Such tough nickel should be an excellent material for building up worn parts, as an undercoat to heavy chromium deposits and for other engineering uses.[7]

Erichsen Ductility. Since it was felt that the ductility of relatively thin coatings might not correspond to that of the thick deposits employed in the tensile tests, specimens of sheet steel 0.05 in. (0.127 mm.) thick coated with deposits 0.0010 in. (0.025 mm.) thick were subjected to the Erichsen test. The plating conditions for the different kinds of deposits were those noted in Table I.

During application of the load in the Erichsen test it was quite difficult to decide by simple visual observation at just what stage the coatings cracked, so preliminary tests were run with each type of deposit by checking the visual appearance of the specimens at definite depths of cup against development of cracks as shown by application of ferricyanide gel to the outer surface of the cup.

The results are assembled in Table III and show that the thin dark matte coatings are almost as ductile as soft nickel from the sulfate bath. The light deposits were less ductile, while the semi-bright were moderately brittle.

Protective Value

Porosity and exposure tests were made with specimens of nickel-plated steel 7.6 cm. by 15.2 cm. in size. The plating conditions for each type of deposit were those given

[6] *See footnote 5.*
[7] *W. A. Wesley, Met. Ind. (N. Y.), 36, 385, 424 (1938).*

Table II.

Spec. No.	Type of Deposit	Ultimate Tensile Strength lb./sq. in.	Ultimate Tensile Strength kg./cm.²	Elongation Per Cent in 2 in. (5 cm.)	Hardness (Vickers)
A2	Light Matte	97,600		12.5	225
A3		102,900		13.0	240
A4		96,300		13.0	225
A5		96,700		16.5	228
Aver.		98,380	6,920	13.8	230
B1	Dark Matte	97,800		22.0	238
B2		99,400		20.0	236
B3		99,500		20.5	240
B5		98,400		19.0	233
Aver.		98,780	6,945	20.4	237
S1	Soft Sulfate	51,800		32.5	150
S2		49,500		28.5	150
Aver.		50,650	3,560	30.5	150

Results of Tensile and Hardness Tests. Thickness of specimens, 0.4 to 0.6 mm.; plating conditions, see Table I.

in Table I. For each batch of specimens, preliminary tests were made to determine the exact time required to deposit a coating of a thickness of 0.0010 ± 0.0001 in. (0.025 ± 0.0025 mm.) as determined by metallographic measurement. In spite of the use of guard rings, the thickness within a distance of 6 mm. from the edges was greater than the above, but this zone was not included in expressing the results of the porosity and exposure tests.

Ferricyanide Tests. Ferricyanide gel tests were made with a hot solution containing 10 g./L. agar, 10 g./L. sodium chloride and 1 g./L. potassium ferricyanide. The solution was applied to the specimens when they were in a horizontal position and it was permitted to gel and stand for 5 minutes. The total number of blue spots visible from a distance of about 2 ft. (60 cm.) was counted at the end of this time.

Salt Spray. Salt spray tests were conducted in a mist of 20 per cent sodium chloride solution. The spray box was not equipped with temperature control. The specimens were hung in a vertical position from glass hooks. The results at the end of 100 hours' test are given in Table IV. All rust spots visible at a distance of about 2 ft. (60 cm.) were counted.

Atmospheric Exposure. Two specimens of each type of deposit were exposed in a vertical position on wooden racks in the Bayonne, N. J., atmosphere. Counts of rust spots visible at 2 ft. (60 cm.) distance were made at the end of one and of four months. No other defects had developed.

Table III.

Type of Deposit	Load at Fracture of Coating		Cup Depth	
	Pounds	Kg.	Inch	Mm.
Dark matte	1,800	816	0.266	6.76
	1,740	789	0.255	6.48
Light matte	920	417	0.174	4.42
	480	218	0.159	4.04
Semi-bright	700	318	0.121	3.07
	760	345	0.128	3.25
Soft sulfate	2,240	1,020	0.29	7.4
	2,280	1,030	0.30	7.6
Unplated steel	3,920	1,780	0.56	14.2
	4,060	1,840	0.56	14.2

Comparative Erichsen Ductility Tests on Nickel-Plated Steel. Basic metal, extra deep drawing steel—18 gauge (0.127 mm.); nickel layer, 0.0010 in. (0.025 mm.) each face; mandrel, 0.875 in. (22.2 mm.) diameter; die, 1.00 in. (25.4 mm.) diameter.

Porosity. From the summary of all the porosity tests given in Table IV, it is necessary to conclude that the nickel deposits made from the chloride bath are not noticeably different in protective value from deposits made from the sulfate electrolyte. This contradicts the time-honored belief that accelerated breakdown of the coating made from a chloride bath is to be expected, due to a greater corrosiveness of metal chlorides remaining in the pores of the deposit as compared with metal sulfates.

Hothersall and Hammond[8] con-

[8] *Hothersall and Hammond, Trans. Electrochem Soc., 73, 449 (1938).*

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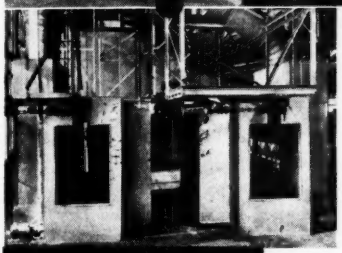

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cluded that the principal causes of porosity in nickel coatings are foreign matter suspended in the plating solution, foreign matter in the surface of the basis metal and roughness of the basis metal. The fact that deposits made from electrolytes as different as the chloride and the sulfate are nevertheless of approximately equal protective value indicates that porosity is not primarily dependent upon solution composition. This observation is consistent with the physical obstruction theory mentioned above.

Characteristics of the Plating Solution

Tank Voltage. The tank voltage in nickel plating is the algebraic sum of a number of potential differences caused principally by the resistance drop through the electrolyte, polarization of the anode, polarization of the cathode and differences in concentration of the electrolyte. Tank voltage readings may be markedly affected by the shape of the container, the electrode sizes, shape and spacing, the type of anode bag, the type of anode, and the temperature and degree of agitation of the electrolyte. It is obvious that such readings are of little use unless these factors are described.

A direct comparison of tank voltages in the chloride and the sulfate electrolytes was made by E. J. Roehl. It was done in a rubber-lined steel tank 36 in. (91 cm.) long, 18 in. (45.7 cm.) wide and 36 in. (91 cm.) deep, inside dimensions. It contained 100 gal. (379 L.) of solution. There were 8 rolled depolarized nickel anodes along each side of the tank which were each 27 in. (69 cm.) long with 22.5 in. (57 cm.) actually immersed below the solution level. They were

Table IV.

Type of Deposit.....	Dark Matte		Light Matte		Semi-Bright		Soft Sulfate	
Specimen.....	1	2	1	2	1	2	1	2
Ferricyanide Test:								
Front	14	60	20	10	70	15	60	14
Back	53	38	12	3	13	33	4	10
Aver. of 4.....	41		11		33		22	
Salt Spray Test:								
Front	3		7		4		4	
Back	2		3		6		7	
Aver. of 2.....	3		5		5		6	
Atmospheric Test:								
1 Month								
Front	15	11	12	22	18	18	25	18
Back	20	18	11	13	14	9	25	8
Aver. of 4.....	16		15		15		19	
4 Months								
Front	31	15	18	18	18	14	14	25
Back	50	43	29	32	19	29	47	33
Aver. of 4.....	35		24		20		30	

Porosity Tests. The number given is the total number of pores counted per one face of a panel of area 1.02 dm.²

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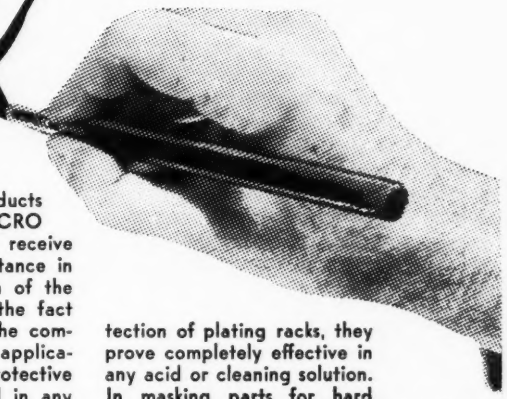

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uniformly spaced apart to cover a distance of 25 in. (64 cm.) measured from the outer edge of the first anode to the outer edge of the eighth. The anodes had been about one-half consumed, so that the average width of the immersed portions was about 1.75 in. (4.4 cm.). The total anode area

Table V.

Fraction of Nickel Present as		Specific Conductance Reciprocal Ohms per Cm.
Chloride	Sulfate	
0.00	1.00	0.0755
0.055*	0.945*	0.0837
0.25	0.75	0.104
0.50	0.50	0.133
0.75	0.25	0.165
1.00	0.00	0.189

**Standard sulfate composition.*

Specific Conductance. Solution composition, 75 g./L. (2.55 *N*) nickel, 30 g./L. boric acid (0.48 *M*); temperature, 130 ± 0.1° F. (54.44 ± 0.05° C.); pH, 3.8 (quinhydrone electrode).

was estimated to be 1,260 sq. in. (81 dm.^{2}). No anode bags were employed.

The cathode was a nickel-plated steel sheet 28 in. (71 cm.) long by 22 in. (56 cm.) wide. The immersed area was 1,232 sq. in. (79 dm.^{2}). The anode-to-cathode area ratio was therefore 1.0. The anode-to-cathode spacing was 6.5 in. (16.5 cm.) measured from center to center of the anode and cathode bus bars. The two baths, which were compared successively in the same tank and with all conditions duplicated, were prepared from technical salts with the regular compositions which were checked by analysis. The electrolytes were thoroughly agitated before each run but there was no agitation during an experiment.

The tank voltages were measured with the aid of a voltmeter connected to the anode and cathode bus bars. Many of the readings were checked by connecting the voltmeter leads directly to the cathode and several of the anodes to make certain that there was good contact between the electrodes and the bus bars. Readings were taken after adjusting the current to successively lower values.

The results are presented graphically in Figure 8. They show that the tank voltage, hence the power costs, for the sulfate bath are 2.0 to 2.2 times greater than those for the chloride bath under test conditions which can be considered representative of average commercial practice. The results also show that the maximum cathode current density obtainable under these conditions, with a 6-volt generator and the relatively large cathode, would be only 32 amp./sq. ft. (3.4 amp./dm.^{2}), whereas changing over to an all-chloride solution would permit use of current densities as high as 74 amp./sq. ft. (8.0 amp./dm.^{2}) at 6 volts.

Conductivity. The principal reason for the small tank voltages required with the chloride bath is that the specific conductance of this electrolyte is very much higher than that of sulfate baths. B. B. Knapp of this laboratory determined the specific conductivities of solutions of the same nickel and boric acid content but of different sulfate - to - chloride ratios The apparatus he used consisted of an alternating current galvanometer, a Wheatstone bridge and an immersion-type conductance cell of dimensions selected to give a high resistance compatible with the low frequency (60 cycles) of current employed. The cell was made by sealing pure nickel electrodes on the ends of a 10 mm. glass tube 30.5 cm. long. Less polarization was observed when such electrodes were used than when platinum was tried. The cell was immersed in an oil bath which in turn was im-

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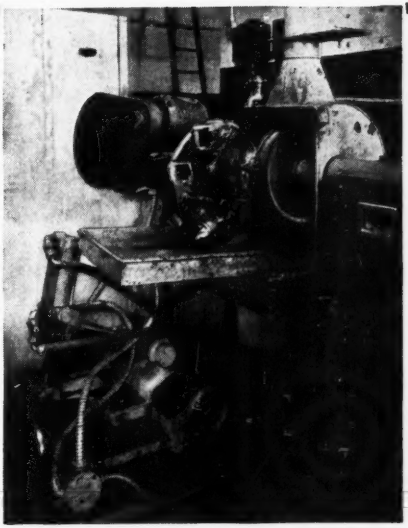

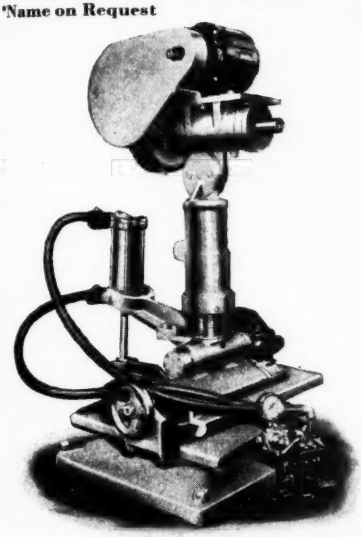

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mersed in a water thermostat. The temperature of the electrolyte was thus controlled at 130 deg. F. ± 0.1 deg. (54.44 deg. C. ± 0.05 deg.).

The straight-line relationship in Figure 9 indicates that the conductance of mixed solutions of nickel sulfate and chloride are additive. This also means that decrease in tank voltage is to be expected with increase in chloride content of a plating bath all the way up to the all-chloride solution. Waite[9] and Blum and Kasper[10] had shown that some of the characteristics of chloride deposits are obtained in full measure even when the chloride content is only 25 to 40 per cent of the total nickel salt content, but the conductivity data show one advantage of the all-chloride solution over baths containing sulfate.

The values of conductance of a solution 0.25 *N* with respect to Cl and containing 67.5 g./L. nickel instead of 75 g./L., as reported by Flowers and Warner,[11] were 0.0867 recip. ohm-cm. at pH 5.3 and 0.0882 at pH 1.9. From these a specific conductance of 0.0874 would be estimated for a solution at pH 3.8. This conductance is plotted in Figure 9 and shows good agreement with the new curve.

It is interesting to compare the relative tank voltages in the regular sulfate bath and in the chloride bath with the ratio of the resistivities of these two compositions. The tank voltage ratio is between 2.0 to 2.2 whereas the ratio of the conductances is 0.0837:0.189, which is the reciprocal of the ratio of the specific resistivities of the two solutions and equals 2.26. The tank voltage at ordinary current densities seems to be largely determined by the resistivity of the bath. It is therefore to be expected that the power savings accomplished by replacing nickel sulfate with nickel chloride in a given plating solution will increase uniformly with increase in chlo-

[9] *See footnote 6.*
[10] *See footnote 5.*
[11] *Flowers and Warner, Trans. Electrochem. Soc., 62, 77 (1932).*

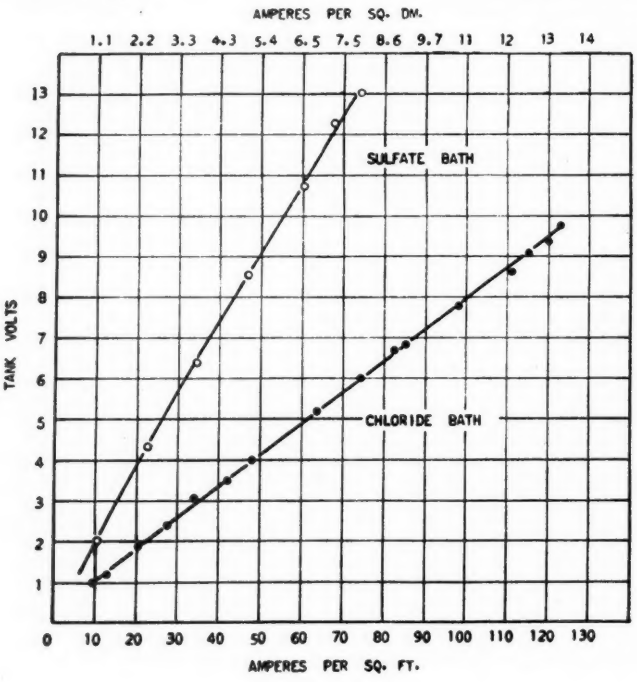

Fig. 8—Tank voltages at pH 4.0 and temperature 130° F. (54° C.).

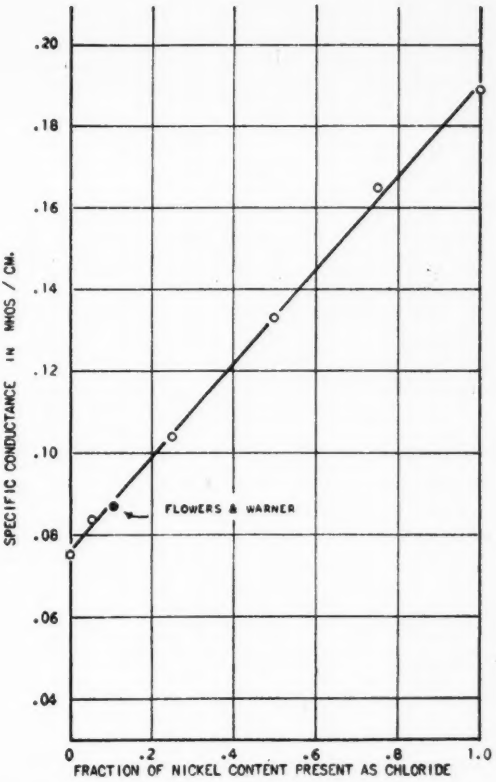

Fig. 9 — Specific conductance of nickel plating baths. Nickel content, 75 g./L. (present as sulfate and chloride); boric acid, 30 g./L.; temperature, 130° F. (54.4° C.); pH, 3.8 (electrometric).

ride content until all the sulfate has been replaced.

Cathode Efficiency. There are at least two ways in which the cathode efficiency of a plating bath can have an important effect upon its commercial use. First, if the cathode efficiency differs considerably from the anode efficiency, maintenance of a constant acidity or pH of the bath becomes difficult. Nickel plating baths are generally operated with soluble anodes and under conditions yielding very close to 100 per cent anode efficiency. It is desirable, therefore, to obtain a high cathode efficiency. Second, cathode efficiency may play an important role in determining the throwing power of the bath. In nickel plating solutions, cathode efficiency decreases with decrease in current density. It is obvious that a bath in which a large drop in current efficiency occurs as the current density is lowered will show poorer throwing power, other conditions being equal, than one in which the decrease is less precipitous.

Cathode efficiency determinations were made by E. J. Roehl with the aid of a copper coulometer. The nickel cell, similar in size and shape to the coulometer, was a 2-liter beaker 11.4 cm. in diameter equipped with a cylindrical anode of sheet nickel fitting against the wall of the cell. The cathode was a nickel-plated steel rod 12.7 mm. by 127 mm. in size, coated at the top and bottom with a synthetic chlorinated wax resist, leaving exactly 102 mm. of the rod bare. The liquid level was adjusted in all cases to a depth of 108 mm. which covered the bare cathode area completely. Whereas the coulometer was operated at room temperature, the nickel cell was immersed in a constant temperature water bath which maintained the solution at the desired temperature ± 1 deg. F. (± 0.5 deg. C.). The runs were 0.5 to 2 hours in duration, depending upon the current density used.

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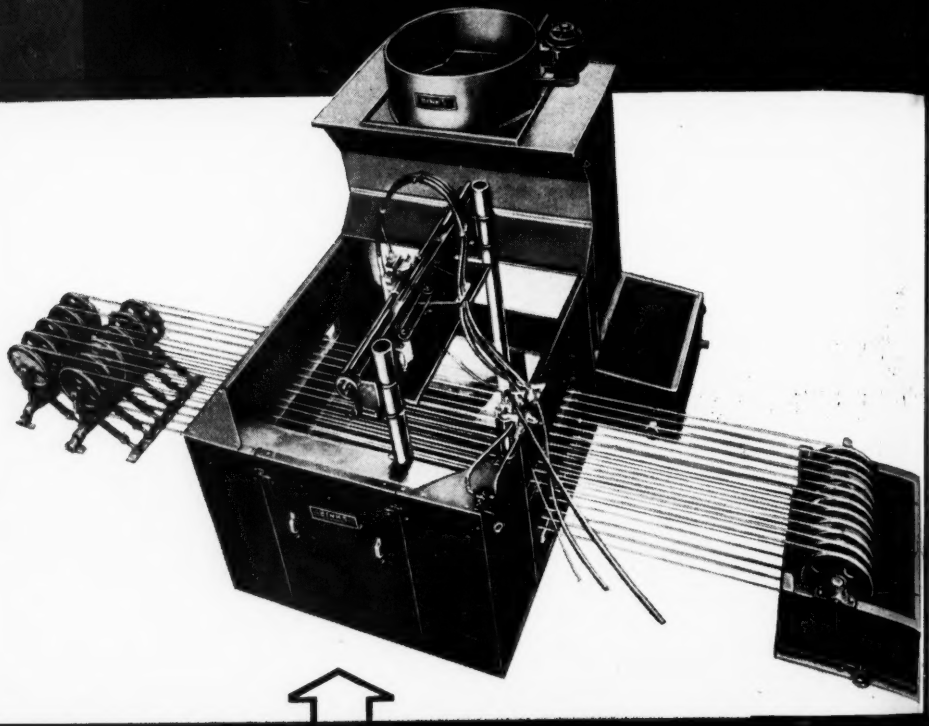

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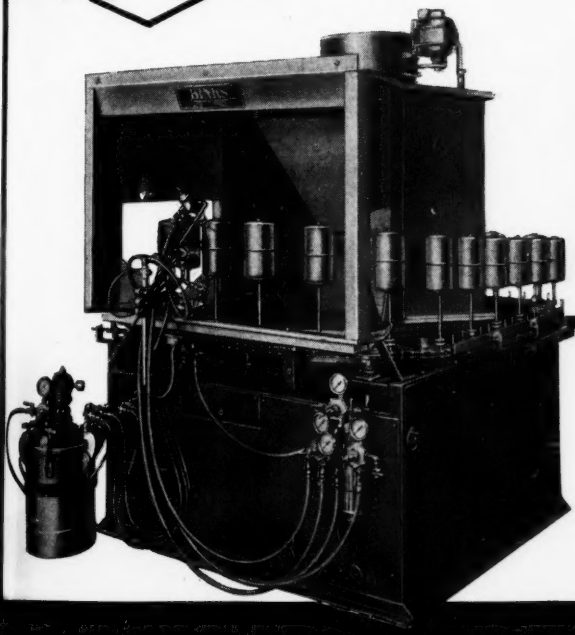

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The results are presented in Figure 10 and show that, whereas the efficiencies in both baths are high at pH 5.0 and do not drop off much even at very low current densities, at pH 2.0 there is a considerable difference in favor of the chloride solution. This result was not unexpected because a few cathode efficiency measurements on all-chloride nickel plating solutions by other workers[12] have shown them to be superior to sulfate baths, especially at low pH values.

General Discussion

The first question which will arise in the reader's mind upon learning the advantages of the nickel chloride plating bath is: why have not these advantages been discovered sooner and commercial use made of them? The answer is not obvious. As noted before, workers interested in refining nickel have never hesitated to explore the possibilities of a chloride electrolyte for this purpose. Perhaps the present use of sulfate electrolyte is chiefly due to the former lack of suitable materials of construction resistant to corrosion by the chloride solutions. Again, perhaps the worker interested in nickel plating has always been discouraged by the dark surface appearance of the chloride deposit. The refiner would pay little attention to this but much to the analysis of the product. Blum and Kasper[13] sought the most ductile deposit possible, hence abandoned the chloride bath for electrotyping even though their work demonstrated a number of advantages of that bath over the sulfate solution. Waite[14] also showed important advantages in high chloride baths but the scope of his work was limited by an experimental procedure in which deposits were made at only one pH value of each solution studied.

Advantages of Chloride Bath

1. Low Tank Voltage. The maximum voltage available with commercial generators of the type used in electroplating establishments is 12 volts. If it is attempted to operate a large nickel-plating tank at capacity, that is, with the cross-section of the bath substantially filled with work to be plated, the maximum current density which can be used is about 50 amp./sq. ft. (5.4 amp./dm.^{2}) since this requires a tank voltage of about 12 volts. This limitation has been noted by E. M. Baker.[15] Under the same conditions the chloride solution would permit the passage of over 100 amp./sq. ft. (10.8 amp./dm.^{2}).

The power cost can be cut substantially by changing over from the sulfate to the chloride bath. This cost is not considered an important factor in ordinary nickel plating as contrasted with refining. Nevertheless, the investment in generator equipment and its maintenance and repair are worth consideration even in the plating process. Professor E. M. Baker suggested to the authors that generators could be operated at considerably less than

[12] *Blum and Kasper, Trans. Faraday Soc., 31, 1203 (1935); H. E. Haring, Trans. Electrochem. Soc., 46, 107 (1924).*
[13] *See footnote 5.*
[14] *See footnote 6.*
[15] *E. M. Baker, Trans. Electrochem. Soc., 59, 383 (1931).*

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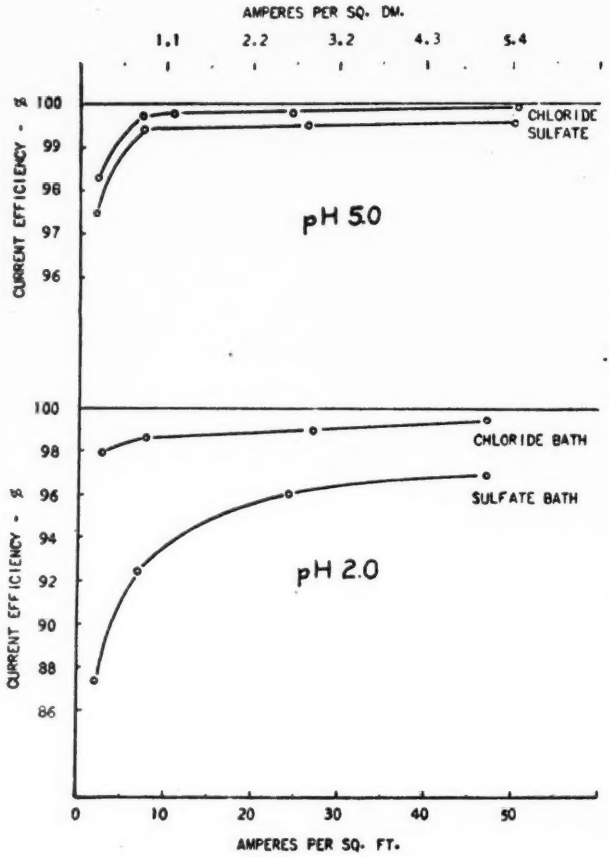
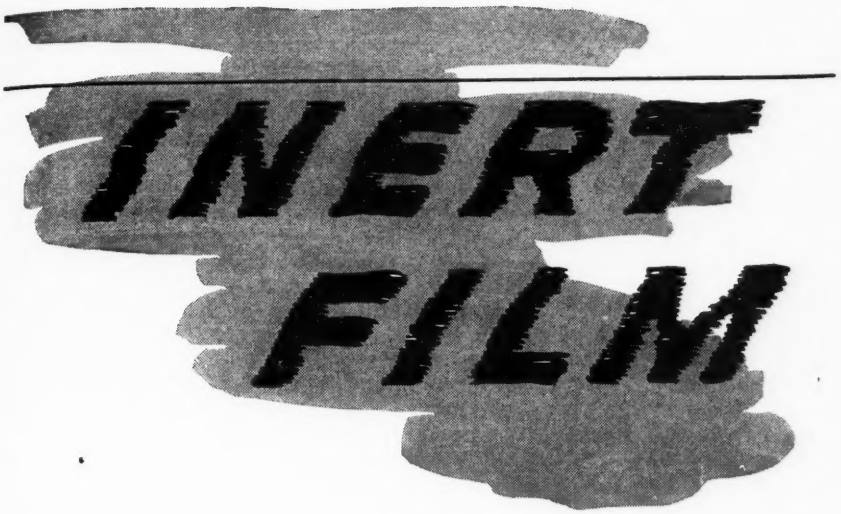


Fig. 10—Cathode current efficiency, 130° F. (54.4° C.).

normal excitation, thus saving somewhat in brush and commutator wear and maintenance expense. Again, power costs become more important when heavy nickel deposits are made, as in electrotyping, forming and building-up worn parts.

2. Ease of Buffing. The greater smoothness of the fine-grained deposits from baths rich in chloride has been noted by Waite and by Blum and Kasper. Pinner and Borchardt have reported that the costs of buffing decrease in actual commercial experience as the chloride content of the plating bath is raised. Qualitative tests made in connection with the present work with the aid of a polishing lathe employing 6-in. (15-in. cm.) polishing and buffing wheels indicated no marked difference between the dark matte deposits and the smoothest coatings from the sulfate bath but did demonstrate that the light matte and semi-bright deposits were much easier to polish. The semi-bright coatings 0.001 in. (0.025 mm.) thick were so smooth that they were readily brought to a bright, mirror-like finish without the use of cutting compounds and with only slight buffing on a soft rag wheel containing rouge.

3. Heavy Deposits. The greater smoothness of thick deposits, lower tendency to form nodules, trees and built-up edges are attractive advantages of the chloride electrolyte for engineering uses such as electroforming and salvaging worn parts. For many of these applications the combination of an intermediate hardness with the high strength and satisfactory ductility of the deposit is much to be preferred over the physical properties of either very soft or very



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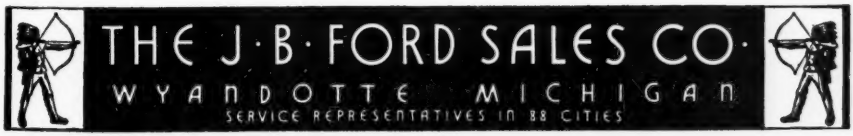


hard nickel. Ease of control of the bath, to be discussed, and lower power costs are important assets in making thick deposits.

4. Ease of Control. The composition of the chloride electrolyte is very simple, there being but two ingredients. The wide range of plating conditions under which sound deposits are obtained, the greater freedom from pitting and the high anode and cathode efficiencies all contribute to making this bath easier to operate and more nearly fool-proof than the sulfate electrolyte. Cleanliness is promoted by the fact that the chloride salts do not "creep" and form unsightly messes of green salt above the solution level.

5. Freedom from Pitting. It is possible that pitting will be encountered in operating large volumes of the chloride bath under commercial conditions but this was certainly not indicated in the laboratory work. Additions of oxidizing agent were required to prevent pitting only in freshly prepared baths, whereas daily additions were always necessary in plating from the sulfate electrolyte under identical laboratory conditions.

6. Cathode Efficiency. The cathode efficiency of the chloride electrolyte is higher than that of the sulfate solution under all the conditions investigated.

7. Heating of Solution. The heat generated when it is attempted to operate a sulfate solution with large amounts of work at very high current densities is so great that it may be necessary to use cooling coils in the bath. This is being done, for example, in a tank in which bumper bars are plated at 90 amp./sq. ft. (9.7 amp./dm.^{2}) in a commercial plant. This difficulty would not be encountered with a chloride bath until much higher current densities were employed.

Disadvantages of Chloride Bath

The principal disadvantage of the chloride electrolyte lies in the greater corrosiveness of the solution. Lead corrodes rather rapidly in it. A few years ago this would have been an overwhelming defect, but the present availability of rubber-lined steel for tanks and pipe-lines, as well as rubber linings or hard rubber for other parts of equipment, diminishes its importance. High silicon iron can be used for pumps, heat exchangers and other cast parts.

For some uses, the fact that deposits from a chloride bath are harder and correspondingly less ductile than soft deposits from other baths would be a disadvantage. For most purposes, however, the greater toughness of the former would be an advantage.

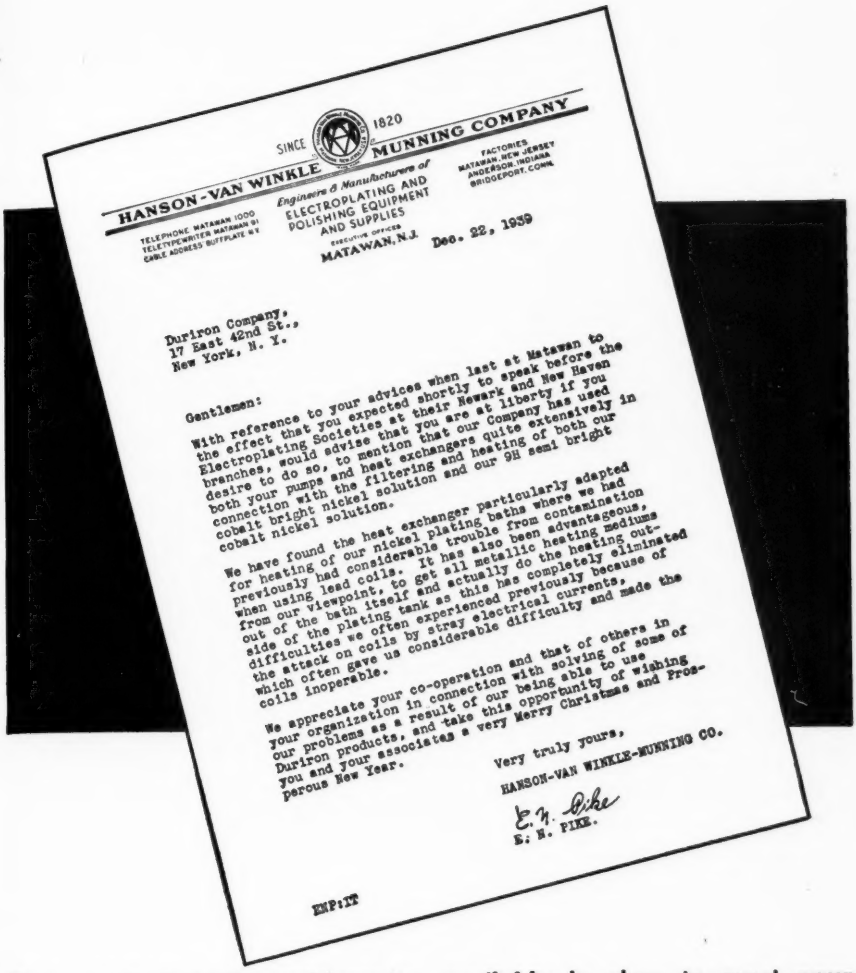
The cost of nickel chloride and of hydrochloric acid (to adjust pH) is somewhat higher than that of the corresponding sulfates but this would seem to be a minor part of the cost of electroplating.

Intermediate Chloride Concentrations

It may well be that further study of electrolytes containing both sulfate and chloride would disclose an intermediate composition which would be less corrosive than the chloride bath and productive of more ductile deposits, yet would retain to a large extent the advantages of the sulfate-free electrolyte. In any event, the present work indicates that the modern trend toward use of higher chloride contents in the Watts-type solution is a sound one and is to be encouraged.

Acknowledgment

The authors wish to express their gratitude for the aid of E. J. Roehl and B. B. Knapp of this laboratory who carried out some of the experiments described in this report.



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Dec. 22, 1939

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BARREL FINISHING OF METAL PRODUCTS

Added Factors in the Barrel Finishing of Plastics.

By H. Leroy Beaver

QUESTIONS that very often arise from those interested in the subject of plastics finishing are: "Do all of the popular plastics respond to the same treatment with the same polishing materials, and do all plastics require the same operating time cycles?"

While it is true, at least in a general way, that all plastics are operated in pretty much the same manner, there are at the same time differences in the character of the materials which permit one material to be finished faster than another. In addition, there are other factors that require differences in operating technique in the barreling process.

In discussing the subject only a short time ago with a well-known authority on the finishing of nonmetallic materials in barrels, we had no difficulty in agreeing upon a general classification of these materials. From the standpoint of hardness, we formed the following groups:

Class No. 1 — (Hardest) Phenol, Urea, Formaldehyde, Vegetable Ivory and Bone.

Class No. 2—(Intermediate) Celluloid, Cellulose Acetate, Casein, Fibre, Hard Rubber, Hard Wood and Resin Bonded Materials.

Class No. 3 — (Soft) Cold Molded Articles, Soft Woods, Semi-Hard Rubber and similar materials.

Having the hardness factor in mind, we start finishing operations following certain basic principles and then vary the operating cycle, depending largely on the type of material.

In a general classification, as set up, it must always be borne in mind that the materials have quite wide variations in their make-up as, for example, the Thermo Setting Molding Powders. A powder which is loaded with cotton flock and made into a casting will not finish as readily or with as high a luster as a casting made from a powder in which only a fair proportion of wood flour has been used.

The only materials from our research experience for which we can make an exception are the Formaldehyde Resins. In this case, we find that the very dark blues or reds often

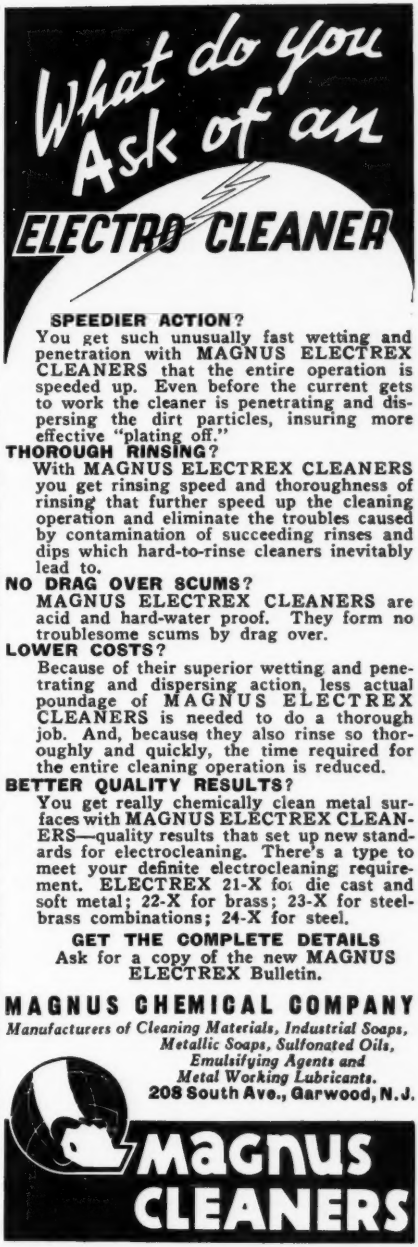
give trouble because they are so heavily loaded with coloring materials.

In Class No. 2 we have always found wide variations in the materials used, particularly those of one producer and other. Celluloid, for example, we can generally divide into two classifications. The higher priced, top-grade material finishes very readily but the cheaper grade, which probably contains a greater amount of filler material, cannot be finished as readily or as nicely as the top-grade material. This presents just another instance that very often it is more economical to use top-grade material which, while its first cost is greater, offers a lower cost in the finished product due to speed of operation as well as the quality of the finish obtained.

From the standpoint of hardness classifications, the Acetates give the most trouble. It must be considered, however, that plastics when compared with other materials, and especially metals, still represent a comparatively young industry. As the materials themselves as well as the technique of molding, slicing, sawing and other methods of forming are further perfected, it may be reasonably supposed that finishing methods not only in barreling operations, but other methods of finishing such as sand belt definning and dressing of parts and the various finishing operations performed with buffs and compositions will also be more highly perfected.

In Class No. 3 more or less difficulty is experienced which requires the exercise of great care in the development of operating procedures for each given material.

As to finishing costs, by present methods, the average cost of finishing, for example, 1,000 fountain pen barrels in an average size plastics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finishing barrel would be approximately 12 cents. For materials and for unloading the barrels and for the operations of roughing, intermediate matte finish and final polishing operation, the average labor would require about one hour.

To those interested in the barrel finishing of plastics, the designations for some of the materials used, and especially the wood pegs might well be confusing. In a recent issue of PRODUCTS FINISHING, we were able to illustrate the various sizes of pegs, wood blocks, balls, and so on, now in general use. We have been asked "How in the world can anyone figure out any sense from the sizes as they are designated?" We will admit the question is a fair one and we, too, were just as much confused in our initial approach to the subject by such symbols as No. 4-8 and 9-4 or $\frac{5}{16}$ x 6. It may be explained that these are the peculiarly adopted symbols for wood pegs by their manufacturers (there are only two, or perhaps three at the most) to indicate the respective sizes, and they are explained as follows: The 4-8 pegs are ⅛ in. square and 4/8 or ½ in. long; $\frac{5}{16}$ x 6 means that the peg would be $\frac{5}{16}$ in. square and 6/8 in. long. The same explanation applies to 9-4 which means that the peg would be ¼ in. square and 9/8 long. Just why the pegs should be designated in this way we do not know and have been unable to learn, but these sizings have been in use for many years. Perhaps, as we go along, we may be able to make some changes in the method of indicating the sizes of the various pegs that will make for greater clarity.

Plastics finishing pegs are not sold by count but by weight and most generally in 100-lb. lots. It may come somewhat as a surprise to those readers unfamiliar with plastic finishing processes as at present used to learn that 100 lbs. of pegs on the average will provide a bulk of approximately four bushels. To be exact, the pegs will average about 24 lbs. to the bushel. A bulk lot of 100 lbs. of pegs may perhaps be better visualized by thinking of a standard four-bushel bag of peanuts, as they are generally packed for shipment, because in outward appearance, at least, they appear very much the same.

Incidentally, the pegs are not made from oak or hard maple as many suppose, but principally from beech wood. They are quite readily impregnated with the various forms of oil and wax solutions with which they are treated before they are used in the various finishing processes.

In a very interesting little booklet, issued by the Celluloid Corporation, we find this interesting commentary:

> "A little acorn, according to legend, stands a p r e t t y good chance to grow into a great oak. Even legend, however, w o u l d think twice before allowing a broken billiard ball to grow into a great industry. Yet that, in effect, is how Celluloid Corporation and the entire plastics industry got its start.
>
> Back in 1868, when Ulysses S. Grant was first elected and Reconstruction started in the South, John Hyatt decided to do a little reconstruction on his own hook. His field was the ivory billiard ball. In those days ivory was neither plentiful nor cheap. Hyatt wanted a substitute material. He went ahead and produced the world's first plastic. He did it by blending nitrated cellulose and camphor under pressure."

From this point, just by way of illustration, Celluloid as a plastic may be found in a total of over 25,000

different applications.

Barrel finishing processes came at a much later date, and it has been said and is probably true that the present fabricators of plastics are in reality "graduates" from what are sometimes known as the "Bone Ivory and Shell Days." For example, in the early barrel finishing operations on Celluloid a wet cutting down operation with water and abrasives was used and this was termed "ashing." In present cutting down operations, sawdust treated and dusted with various kinds and sizes of abrasives are used on plastics. While the operation is performed in a different way and with different materials, the operation still is designated as the "ashing" process. To the uninitiated, this term simply would mean the removal of a part of the surface of the parts by an abrasive action.

If we look back at barrel finishing procedure as practiced about 1910, we think that we could say that the process was then in its "swaddling clothes." Nothing was known at that time of either the relation of specific gravity of the parts to be finished to that of the finishing material or of the importance of the regulation of control of the speed of the barrels. If we now look at the present practice of plastics finishing in barrels, we find that it has inherited the "swaddling clothes" of the infant of thirty years ago.

We now know that in barrel finishing of metal products that the parts to be finished must be at least slightly in excess in specific gravity to the specific gravity of the burnishing materials used in order that they might be continuously maintained under pressure within the burnishing mass. This means, of course, that such metals as steel, iron, brass, bronze or

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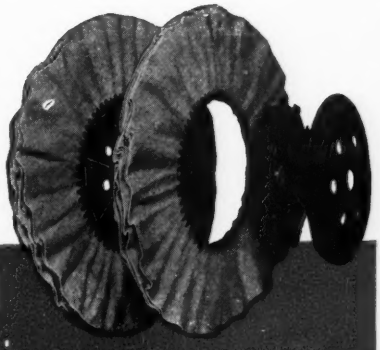

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zinc, due to their specific gravity will remain within the mass, but that a metal such as aluminum, due to its lack of specific gravity cannot remain within the mass but will be forced to the surface.

In the barrel finishing of plastics this rule has been completely ignored. As we have previously explained, 100 lbs. of wood pegs will bulk about four bushels but the same quantity of let us say plastic button blanks will weigh far in excess of that amount. Plastics in specific gravity will generally average from 1 to 1.33 but wood pegs would hardly approximate 0.42 and where in barrel finishing metal products, the light aluminum will be forced to the surface, in plastics finishing the plastic parts in normal barrel speeds will sink toward the bottom of the barrel and the pegs being so much lighter will float on top. In an effort to overcome this condition, one plastics manufacturer recommends that barrels instead of revolving around their axis have the trunnions mounted in the middle of the barrel on either side so that when in operation the barrel will have an "end-over-end" motion. In place of this a square box-shaped barrel can be used for the work. Both recommendation are submitted as illustrating finishing by the action of impingement in its most drastic form and even more objectionable than the impinging action obtained by the use of oscillating types of barrels.

Let us compare such a procedure in the finishing of plastics with that of the understanding of a writer in "American Machinist," April Issue, 1910, from which we quote as follows:

> "The process consists of placing the work in a tumbling barrel preferably of wood of the horizontal type, so as to prevent scratching of work against the sides of the barrel, and then DUMPING into the barrel a large quantity of small steel balls measuring in bulk about twice that of the work to be burnished together with a soap mixture in which the work and balls are confined or held together so that as the barrel rotates, the whole mass of soap, work and balls are **tumbled about, causing the balls to be forced in all directions across all of the work surfaces** * * *"

Aside from the variation in the materials and finishing mediums used, we can now couple this with the actual suggested operations for barrels to about the same period. Where the finishing material is excessively light, we believe it would be fair to question whether the parts were being finished by the pegs constituting the finishing mass or whether the mass floating on top of the parts caused them to receive their finish by a continuous rubbing contact against the periphery of the barrel itself.

When operating cycles of from 48 to 72 hours are required for a single charge of parts, the question might well and properly be asked: "But why so long a time?" If we were to base a conclusion on this factor, we would be compelled to place the major portion of the blame on the wood pegs and sawdust used in the process as it is at present performed solely because of the wide variation between the specific gravity of the plastic materials which range from 1 to 1.33 and that of the three to four times lighter pegs and sawdust.

Just as the answer to the major problems of barrel finishing of metal products were found in specific gravity and barrel speed, we feel that the same problems must be solved along the same lines in the finishing of

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plastics. What to use as the weight carrying burnishing mass more nearly comparable to a specific gravity of 1 to 1.33 is, of course, the question. Research on many kinds of materials is no doubt now in progress, including our own, and the principal aim of this discussion is to set plastic finishers to work experimenting on new and different materials to the end that the now long time operating cycles may be considerably reduced.

"Flame Cleaning and Dehydrating" is the title of an eight-page illustrated booklet which is now being issued by Air Reduction Sales Company, 60 East 42nd St., New York City. This booklet describes the use of the flame cleaning and dehydrating process to halt deterioration of old steel structures by means of a surface conditioning.

The booklet shows how, by eliminating moisture from the surface and by cleaning the structure down to the bare metal, the Airco flame cleaning and dehydrating process greatly retards paint lift and surface oxidation. The structures illustrated and described in this booklet which have been treated by this process include the Golden Gate Bridge over the bay at San Francisco.

In addition to a diagrammatic sketch showing each operation and time interval between operations in flame cleaning and dehydration, the booklet also shows, by a series of photographs, a surface actually being prepared to receive a new coat of paint.

Other sections of the booklet include apparatus, procedure of operation, regulation of speeds and suggested specifications for various surfaces of metal. Copies of this booklet may be obtained by writing to Air Reduction Sales Company, 60 East 42nd St., New York City.

Pangborn Rotoblast Bulletin No. 211. A new 16-page illustrated bulletin on the complete line of standard and auxiliary Rotoblast Cleaning Tables has just been announced by the Pangborn Corporation, Hagerstown, Maryland.

This bulletin, printed in two colors throughout, is profusely illustrated with typical installation photographs and describes the airless cleaning of flat and fragile work such as stove parts, meter boxes, battery grids, shovels, switch parts, lawn mower and farm implement parts, ring gears, bevel gears, automotive parts, and so on—also sanitary ware, enameling work and other parts requiring proper cleaning and "matte" surfacing without danger of warping, breakage or burring.

The bulletin is divided into two sections; the first describes the mechanical operation of the single standard tables together with general specifications, floor plans, ventilating and motor requirements, for the 6, 8 and 12-foot diameter tables. The second part describes the mechanical operation of the multiple spindle auxiliary type table installations with general specifications, floor plans, ventilating and motor requirements for all standard arrangements and sizes in this group.

There is also a diagrammatic explanation pointing out the economies of the Pangborn "Vaneless" Rotoblast Wheel and a final outline illustrating the Pangborn principle of all-metal frame, cloth screen dust control as recommended for pressure, suction and continuous systems.

A list of some of the many users of Pangborn Rotoblast Tables together with some of the typical daily jobs now being Rotoblast Table cleaned makes this bulletin a very complete treatise on this popular method of economical airless production blast cleaning.

Copies are now available and may be had upon request to the Pangborn Corporation, Hagerstown, Maryland.

"Ideal" Cleaning Machinery for Metal Parts. Plant executives concerned with the washing, rinsing, drying, and burnishing of metal parts will be interested in Catalog No. 40 now being issued by N. Ransohoff, Inc., 210 W. 71st St., Cincinnati, Ohio. This 24-page catalog presents various problems encountered in the cleaning of metal parts and describes the methods and machines used in the solution of these problems. Many illustrations of the application of custom-built equipment are shown, as well as standard installations in well-known plants of the automotive, electrical, radio, and other metal-working industries.

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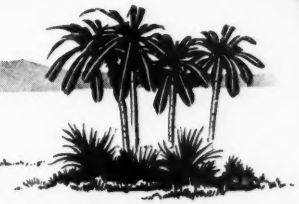

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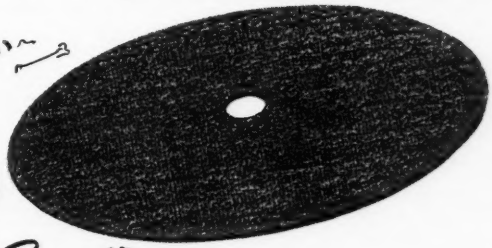

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METAL COLORING THEORY AND PRACTICE—PART 3

By Joseph B. Kushner, Ch.E.
Electroplating Consultant, New York City, N. Y.

THE white precious metals, silver, palladium, platinum and rhodium, offer the metal colorer a rather limited source of hues. With the exception of silver and perhaps palladium, they are not readily attacked by the common reagents to form colored compounds or easily codeposited with other metals to form colored alloys. As a result, the colors of the pure metals themselves are the only ones available to the finisher. These colors are shades of grey, varying from an almost steel grey to an almost white.

In the order of whiteness, the metals run: silver, rhodium, platinum and palladium. An idea of the relative whiteness can be had from the approximate reflectivity coefficients. The coefficients give the percentage of normally incident light reflected back by the polished surfaces of the metals. At the wave length of 0.6 microns, which is roughly about the center of the visible light range, the reflectivity percentages are:

Silver	93%
Rhodium	78%
Platinum	65%
Palladium	63%

Rhodium

Rhodium, one of the most precious members of the platinum family and a metal that is comparatively new to the electroplating field, makes an excellent white finish for costume jewelry and novelties. Over polished surfaces, it deposits in smooth, bright form to give the plated objects a mirror-like finish. It is best applied over a nickel preplate, though it can be deposited directly over silver, gold, platinum or copper.

There are two types of baths for plating and coloring with rhodium: the sulphate bath and the phosphate bath. A typical receipt for the sulphate bath is the following:

Rhodium metal (as sulphate complex)	2 grams
Sulphuric acid	20-40 cc.
Water (distilled)	to 1 liter
Temperature	110-120 degs. F.
Voltage	5-7

For plating on tin bearing alloys such as white metal which would tend to become discolored in the sulphuric acid solution, the phosphate type of bath is preferable. The formula for this is exactly the same as the one for the sulphate bath except that phosphoric acid is substituted for the sulphuric acid and a rhodium phosphate complex is used. This bath can be operated at slightly lower temperatures than those given for the sulphate bath. The complex rhodium salts cannot be made and must be purchased in liquid form from one of the rhodium supply houses.

Platinum

Platinum offers considerable possibilities as a variant for rhodium in the coloring of costume jewelry. The early types of platinum plating solutions gave poor, dark and non-adherent deposits and for this reason platinum plating fell into disuse. Modern electrolytes, however, produce smooth, dense and adherent deposits of platinum that are only slightly darker than those of rhodium. A formula which the author found to give good results is given here.

Platinum di-ammino nitrite ("P" salt).....5 grams
Phosphoric acid.....80 cc.
Water.....to make 1 liter
Temperature....140-150 degs. F.
Voltage 2½

Care must be taken to see that the temperature does not exceed 140 deg. as above this, the platinum salt will rapidly decompose. Some difficulty may be encountered in getting the platinum salt into solution but with careful heating and stirring this quantity of "P" salt can be dissolved in a few minutes. If necessary, to insure complete solution, the temperature can be temporarily exceeded.

Platinum Grey

A number of years ago when platinum was relatively inexpensive, it was used to produce a finish on silverware known as French Grey. A dilute solution of platinic chloride or chorplatinic acid (1-10 per cent) in water or alcohol was wiped on the silver with a clean linen rag, or else the silver was immersed in it, with the result that the platinum salt was reduced by the silver, leaving a deposit of grey or black platinum on it. The reaction can be expressed by this equation:

$$4Ag + PtCl_4 = Pt + 4\ AgCl$$

Dark shades of platinum grey are produced from alcoholic solutions because the platinum precipitates in finer form from this type of solution. At this point it is interesting to digress for a moment to learn the reason for this.

The finer a precipitate, the darker it seems to appear. This can almost be called a principle of optics. The finer it is, the more light absorptive and refractive area it possesses per unit mass, and as a result, it appears darker. Since this is the case, the finest precipitates will produce the darkest colors. An example of this is gold, which above a certain particle size appears yellow and which when precipitated in fine form appears deep purple or almost black. To obtain the finest precipitates, non-aqueous solvents should be used inasmuch as it is a chemical axiom that when two compounds react to form a precipitate in the presence of non-electrolytes, the precipitate is generally colloidal. This is the reason alcohol solutions give the darkest colors.

Palladium

Palladium is darker than either rhodium or silver. The color is not particularly pleasing and the deposit offers no great corrosion resistance. A palladium plate is susceptible to finger staining as well, therefore it is seldom plated for itself alone. Another disadvantage is the fact that palladium must be plated below the gassing point, as it has a great avidity for hydrogen, and will absorb sufficient of it to mar the plated surface, if gassing does occur. A bath formula which the writer has not tried but which is given by Keitel and Zscheigner[1] is the following:

[1] *U. S. Patents No. 1,779,457 and No. 1,779,436.*

Palladium di-ammino nitrite ..... 10 grams
Ammonium nitrate ..100 grams
Sodium nitrite ..... 10 grams
Ammonia ..... 50 cc.
Water ..... 1 liter
Temperature .....203 degs. F.
Voltage 1.2

Silver

The color of silver has always appealed to the human eye. Its peculiar soft white, yet brilliant luster has always been symbolic of luxury and wealth.

For practical purposes, silver is always deposited from cyanide baths. A typical silver plating bath has the following formula:

Silver cyanide .....5 oz./gal.
Potassium cyanide ....5 oz./gal.
Potassium carbonate ..6 oz./gal.
Room temperature
Voltage 1-2

This bath produces white, matte deposits. To obtain bright deposits, the total cyanide can be increased to about 9 ounces per gallon. A small quantity of carbon disulfide dissolved in some silver strike solution can also be added to the bath.

For the watch dial trade, a silver iodide bath is sometimes preferred, as it gives intense dead white coatings of silver. A trick of the trade to obtain a dead white surface is to flash on some copper before silver plating. The following is a good silver iodide bath.

Silver (as nitrate) 26 grams/liter
Potassium iodide 576 grams/liter
Sulphuric acid .. 2.5 grams/liter
Temperature, room or warm with stirring.
Voltage 1-1.5

Sulphide Finishes

Silver readily reacts with sulphur bearing compounds to produce silver sulphide, a black or blue black substance. This substance, anathema of the housewife and restauranteur, is the source of most of the colors that can be obtained with silver. The reaction that takes place can be symbolized in this way: $H_2S + Ag = Ag_2S + H_2$. A similar reaction occurs with other sulfides such as potassium, ammonium, calcium, Barium, and sodium sulfides. In general, potassium sulphide gives the hardest black and the ammonium salt gives the softest black. All these finishes must be lacquered, as they are subject to progressive darkening.

Yellows and Browns

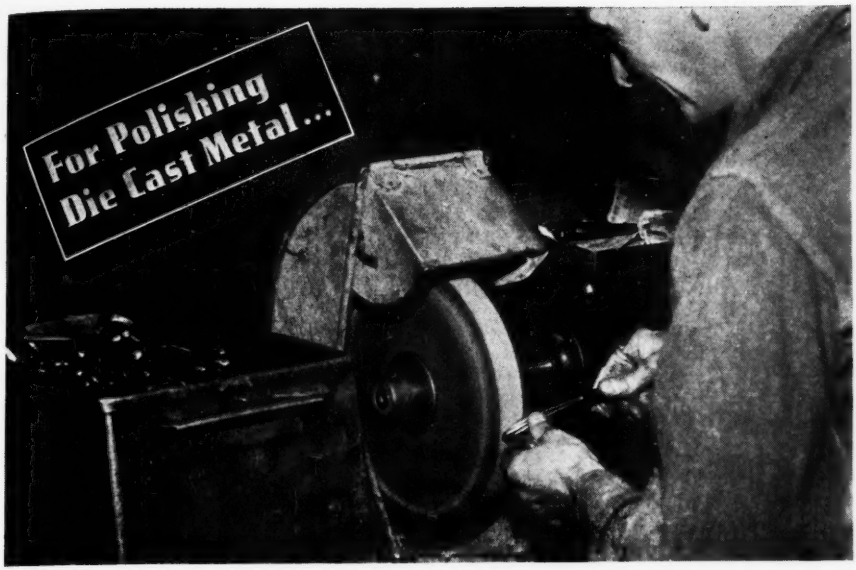
A bath of the following composition will produce golden yellow shades on silver, varying to dark browns.

Barium sulphide .....0.10 ounce
Water ..... 1 gallon
Room temperature

By varying the time of immersion, a series of shades running from yellow to brown, can be obtained. Above room temperature, the color changes take place too rapidly to control. The yellow colors that are produced by b l a c k colored compounds are, of course, due to interference as was explained in part one of this series. Increasing the concentration of barium sulphide to .2-.4 oz. per gallon and heating to 180 deg. results in almost immediate production of the blue black sulphide color.

Potassium sulphide, commonly referred to as liver of sulphur, when used in about the same proportions as the previous formula and at the same temperature gives a reddish brown color on silver. With increasing concentrations and temperatures the blue-black sulphide is instantly formed.

When the dark sulphide finishes



You'll Like Alundum Abrasive

FINISH is usually important where die cast parts are being polished, for in many cases they are subsequently plated. The special sizing methods used in preparing Alundum Abrasive give the uniformity that assures good finish—no oversize grains to scratch and mar. And of course, the special surface treatments given to Alundum Abrasive assure extra "sticking power"—a long lasting wheel head. For "lowest cost per piece polished" it will pay you to use Alundum Abrasive.

NORTON COMPANY, WORCESTER, MASS.

G-93

NORTON ABRASIVES

are desired, there must be a fairly substantial deposit of silver on which to use them. In hot and concentrated solutions of the sulphides, the silver is attacked so rapidly that the colorer will often find the entire coating can be removed by the scratch brush without a sign of silver beneath. This is due to any or all of the following conditions: The deposit is too thin. The sulphide is too hot. The sulphide is too concentrated.

French Grey

As explained under Platinum Grey, years ago silver was given an antique or oxidized effect by the use of solutions containing platinum. The cost of the process is so expensive that it is rarely if ever used at present. Instead, the sulphide finish is used and it is known in the plater's parlance as "Silver Ox." The name is something of a misnomer inasmuch as no oxygen is involved in the process. The French Grey is produced as follows:

The work is plated in the ordinary white silver bath (bright baths cannot be used, as they give streaky results). The smut is then wiped off with pumice and a tampico wheel. Following this, the work is scratch brushed with a crimped wire wheel. It is then dipped into a bath of the composition given here:

Potassium sulphide	0.25 oz.
Water	1 gal.
Temperature	150 deg.

After this dip, the work is relieved on a nickel silver crimped wire scratch brush rotating at about 750-1,000 r.pm. with pumice and water.

Green Silver

A peculiar slate grey green color which is rather poorly adherent can be put on silver by immersing it in a solution made up of the following components:

Iodine	1 part
Water	1 part
Hydrochloric Acid	1 part
Temperature	Boiling

The high temperature causes iodine fumes to come off and for this reason this bath is not recommended. Instead, a bath formulated by the writer is recommended, as it produces delicate shades of light green without the slaty appearance and fuming:

Silver perchlorate	5 grams
Potassium iodide	30 grams
Iodine	2 grams
Ammonia	40 cc.
Water	1 liter
Temperature	Room

The work is well cleaned, then anodically treated in the bath at about 7 volts. After a few minutes it will become coated with a greenish film, which is a form of silver iodide. The work should be rinsed dried at once and lacquered.

Several other interesting coloring possibilities exist.* Antique effects can be had, for instance, by forming silver chloride on the work and reducing cathodically in an alkaline solution. However, all the common finishes with the white precious metals have been described here.

** During the course of this series on Metal Coloring, the writer will be pleased to answer questions on metal coloring. Address inquiries to the author in care of* PRODUCTS FINISHING.

Eyes Are Expensive Targets. American Optical Company, Southbridge, Mass., has recently published a booklet entitled "Eyes are Expensive Targets" which contains valuable information concerning the cost of eye accidents, the causes, and ideas for putting into operation a plan for eliminating the causes and lowering the cost.
Copy free upon request.

Modern Maintenance Methods. A 24-page manual dealing with timely answers to maintenance problems has recently been published by Porter-Cable Machine Company, 1708 Salina St., North Syracuse, N. Y. This manual contains pictures and paragraphs explaining how certain modern mechanical devices can speed and lighten the work of maintenance. These machines have proved themselves in operations of construction and repair.

The finisher, maintenance man, and every craftsman will find the suggestions given in this manual both informative and helpful.

The operations discussed deal with work on metals. Tables at the end of the manual indicate the proper selections of machines and materials to use for any particular job.

A copy of this manual will be sent free upon request.

Ful-Vue Safety Goggle Bulletin. An attractive two-color news bulletin which explains fully all the recent improvements in Ful-Vue Safety Goggles has just been published by American Optical Company, Southbridge, Mass.

The features referred to are the double-braced bridge with its exceptional structural strength that assures long service, the three eye sizes and bridge sizes that permit exact fitting to workers; the special sizes of Ful-Vue Goggles designed to fit every type of face; and the transportation goggle, especially developed to protect the eyes against wind, dust, cinders, flying particles, and glare.

The bulletin also points out that all Ful-Vue Goggles may be fitted with 6-Curve Clear Armorplate lenses accurately ground to the worker's own prescription for corrective glasses. The goggles may also be obtained with Super Armorplate Calobar lenses. The Calobar lense sare scientifically compounded to cut down dangerous ultra-violet and infra-red rays. At the same time, these lenses reduce glare and give clear, accurate and comfortable vision. Both Clear and Calobar Super Armorplate lenses have been scientifically developed to resist impact of rivets, chips, and other flying particles.

A copy of this bulletin will be sent free upon request.

Mention PRODUCTS FINISHING when writing to advertisers.

Did You Know That---

—By keeping records of finishing materials bought and used, a finishing department executive can save both time and money? See page 14.

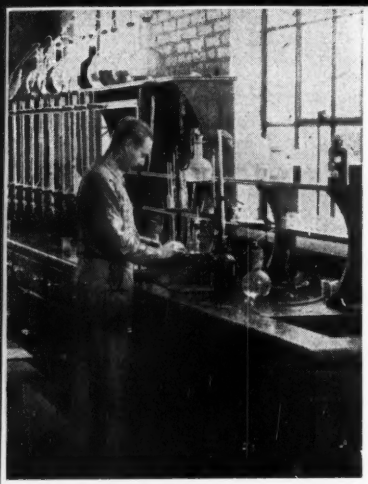
—Completely automatic finishing is available for finishing 15,000 to 20,000 parts per day? See page 29.

—The major problems of barrel finishing of metal products are found in specific gravity of material and parts, and barrel speed? See page 42.

—Tested formulas for precious metal plating solutions are given in the article "Metal Coloring Theory and Practice"? See page 46.

—Special sizing methods are used in the preparation of abrasive used for polishing die cast metals? See page 49.

—Free literature on metal finishing methods and processes is available? See page 78.



THE Finishing FORUM

Color Coding System Used on New Byrd Expedition

A UNIQUE color coding, lettering, and numbering system for identifying all equipment and supplies, and the bases to which they go, is being used on the Government's "U.S. Antarctic Service" now en route to the Antarctic, with Admiral Byrd in command. The system is believed to offer worthwhile possibilities in the handling of materials in industry.

Two ships are being used in this latest South Pole expedition—the "U. S. S. North Star" and the "U. S. S. Bear." Two main bases will be established—one in the vicinity of the former site of Little America, and one about 1,400 miles to the eastward. Red was chosen to identify all items for West Base; green for East Base. A master list on which all items of supplies and equipment are segregated, coded by departments, and described, is the key to the system. A box marked R-149 in red would be identified as radio equipment for the West Base. Similarily a box marked S-WB-142 in green would contain scientific instruments for the Weather Bureau at the East Base. The master list yields a complete description of the particular items in the boxes. The coding system utilizes the regular colors of Kem Lustral Enamel, a new finishing material manufactured by the Sherwin-Williams Company, 101 Prospect Ave. N. W., Cleveland, Ohio. Their use as a means

Do you have a metal finishing problem?

Through the cooperation of outstanding authorities in the fields of metal cleaning, plating, burnishing, lacquering, and so on, PRODUCTS FINISHING is prepared to aid you in the solution of your finishing problem. There is no charge for this service.

Also . . .

If there is a "kink" or short cut in use in your shop, send in a description of it. . . . Each one published will be paid for.

No. 5 Print Test

Determination of the resistance of an organic finish to marking by packing materials, excelsior, etc.

APPARATUS: Cheesecloth, flat steel block one inch square, five pound weight, thermometer, putty.

PROCEDURE: Age the panel twenty-four hours. Place a quadruple thickness of cheesecloth on the finish and allow to stand under the pressure of the block and the weight for twenty-four hours. Maintain the panel at seventy degrees Fahrenheit during the test, measuring the temperature by means of the thermometer stuck to the panel with a lump of putty. The weight, test period, aging period and temperature may be varied to suit particular requirements.

CONCLUSIONS: At the end of the test period, examine the finish for the extent of marking caused by the weight on the cheesecloth.

No. 6 Heat Discoloration Test

Determination of the resistance of an organic finish to discoloration by heat.

APPARATUS: Constant temperature oven.

PROCEDURE: Age two panels twenty-four hours. Place one panel in the oven in a horizontal position and maintain the temperature at one hundred and twenty-five degrees Fahrenheit for one hundred and fifty hours. Carefully wrap the second panel in opaque paper and store in a cool, dry place. The test period, aging period and temperature may be varied to suit particular requirements.

CONCLUSIONS: The change in color and gloss as compared with the untested panel shows the degree of resistance of the finish to heat discoloration.

No. 7 Light Discoloration Test

Determination of the resistance of an organic finish to discoloration by light.

PROCEDURE: Age two panels twenty-four hours. Place one panel twelve inches from and parallel with window, preferably with a southern exposure. Allow the panel to remain exposed at room temperature for sixty days. Carefully wrap the second panel in opaque paper and store in a cool, dry place. The test period and aging period may be varied to suit particular requirements.

CONCLUSIONS: The change in color and gloss as compared with the untested panel shows the degree of resistance of the finish to light discoloration.

No. 8 Outdoor Exposure Test

Determination of the resistance of an organic finish to breakdown during exposure to the weather.

APPARATUS: Suitable rack for holding panels at an angle of forty-five degrees.

PROCEDURE: Completely finish two panels so that no bare metal is exposed. Place one panel on the forty-five degree rack to face the south. The rack should be placed on a roof or in some equally exposed location. Carefully wrap the second panel in opaque paper and store in a cool, dry place. Inspect the exposed panel at regular intervals for one year, or until complete breakdown occurs.

CONCLUSIONS: The change in color and gloss, and evidences of checking, chalking and corrosion of the base metal as compared with the unexposed panel show the degree of resistance of the finish to outdoor weathering.

of identification is said to make the routing of supplies far quicker and surer than where usual labelling methods are employed.

Metal Cleaning Sanitation Code. The American Foundrymen's Association's Committee on Industrial Hygiene Codes, located at 222 W. Adams St., Chicago, Ill., has developed for publication a fourth code in its series of recommended good practices. The first three codes have received a fine reception from the foundry and allied industries. The first two codes are now in second edition. This fourth code entitled "Recommended Good Practice Code for Metal Cleaning Sanitation" has been published in planograph form for distribution.

The subject matter in this fourth code covers recommended practices and installations for alkaline, solvent, solvent degreasing, metal pickling, tumbling mill and abrasive blasting cleaning processes, as well as pertinent information on metal cleaning generally for the prevention of accidents and minimizing exposure to occupational disease. As far as the committee has been able to determine, this is the first time that definite engineering recommendations have been published dealing directly with the hazards involved.

The section on solvent degreasing processes should be very helpful to those considering the newer methods of cleaning by chlorinated hydrocarbons. The abrasive blasting cleaning processes section is timely because it is applicable to old as well as new installations for exhaust and accident prevention requirements.

While the use of tumbling mills is old in most plants today, all types of mills are included in the code, including continuous mills as well as stave, internally and extremely ventilated types of batch loaded mills. An effort has been made to provide more adequate exhaust system requirements to carry the dust and dirt to the dust collection equipment and prevent its dropping to the mill floor, where further dust hazards are introduced in its disposal.

The codebook consists of 42 pages, is illustrated with diagrams and is priced at $2.50 per copy.

Mention PRODUCTS FINISHING when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.

ANODES

Since 1870, when we produced the first cast anode made in this country, Hanson-Van Winkle-Munning anodes have met the most rigid requirements for plating. Metals of the highest purity are bought on rigid specifications, then tested and checked in our laboratory. Melting, pouring and annealing temperatures — the important factors effecting metal structure—are carefully controlled by our metallurgists and skilled foundrymen. Send for Anodes Bulletin AC-104 describing anodes, processes, salts, solutions, dips and other interesting related information.

There are fifteen other Hanson-Van Winkle-Munning booklets on the cleaning, plating and polishing of metals which cover processes, methods, equipment and supplies. We will gladly send you free copies of those covering your problems of product finishing.

Since 1820

HANSON-VAN WINKLE-MUNNING CO.
MATAWAN, NEW JERSEY

Manufacturers of a complete line of electroplating and polishing equipment and supplies

328

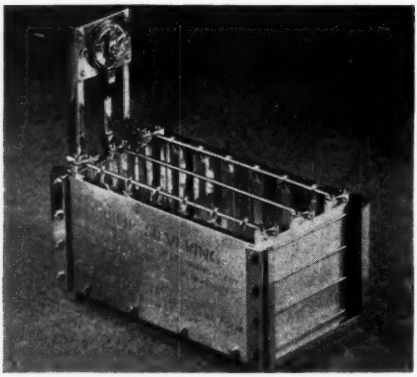
News OF THE INDUSTRY

Electroplaters Honor Philip Sievering

The Masters' Electro-Plating Association, Inc., 123 William St., New York City, held a banquet, entertainment and dance, at the Hotel Delmonico, 59th St. and Park Ave., New York City. Approximately 200 people attended this affair which was the largest in the history of this organization.

The purpose of this celebration was to honor Philip Sievering, president of Philip Sievering, Inc., contract electroplaters of New York, on the 50th anniversary of his entrance into the plating industry. The program included a varied group of speakers who related their experiences with Mr. Sievering from different aspects.

A presentation by Walter Plumacher of Plumacher and Sons, New York City, past chairman of the executive committee of the Masters' Electro-Plating Association, Inc., of a most unusual and original gift was made to Mr. Sievering. The gift consisted of a small hand-made brass model of an electroplating tank, about eight inches long and four inches wide, built exactly to scale and joined by tie rods, just like a commercial full-sized plating tank. Designed and built by Carl Hoehl of the National Chromium Corporation, New York, it even included anode and cathode rods, anodes and a rheostat for the control of the current. The whole model was plated with a heavy deposit of gold by one of the members of the Association, the Cohan-Epner Company of New York, and suitably inscribed.



Gold plated model electroplating tank presented to Mr. Philip Sievering

Pennsylvania Salt Buys New Plant Site

The Pennsylvania Salt Manufacturing Company, Widener Bldg., Philadelphia, Pa., announces the purchase of two tracts totaling 50 acres on the Delaware River at Cornwells Heights, as a site for its new $2,000,000 plant. The plant will replace present Philadelphia operations at Delaware and Oregon Avenues.

The site consists of two pieces of land, one the former Traylor Shipbuilding property owned by the Carlton Company, a subsidiary of the Traylor Engineering & Mfg. Company, Allen-

town; and the other is part of the former Badenhausen Corporation. The properties extend from State Road to the river. Cornwells Heights immediately adjoins the northeast boundary of Philadelphia at the upper end of Torresdale.

The Salt Company recently sold its 62-acre property at Delaware and Oregon Aves., Philadelphia, to the Philadelphia Electric Company in the largest real estate deal in 10 years. The Company has been 72 years at the Philadelphia address. The new site gives 2,000 feet water frontage and will provide, the Company said, "increased production facilities for present products and more adequately provide for producing new products now under development."

Research laboratory and pilot plant operations, which have been cramped, will be moved to the new site. Executive, accounting, and sales offices will remain as at present in the Widener Building. The Company has other plants at Natrona and Easton, Pa.; Penn Yan, N. Y.; Wyandotte, Mich.; and Tacoma, Washington.

Green Electric Reorganizes

The W. Green Electric Co. Inc., 192 Broadway, New York, N. Y., has been completely reorganized and is now under new management. This company has been in the electroplating solution and supply business for more than 50 years. Under the management of Harry A. Enstein, this company intends to expand into the field of moderate size electroplating installations and will shortly announce several interesting developments in plating and finishing solutions and equipment.

Mr. Joseph B. Kushner, authority on electroplating and metal finishing, has been engaged as consultant to handle technical developments and to direct electroplating research in the Green plating and finishing laboratories.

Hilo Exhibit at Sixth International Heating and Ventilating Show

The accompanying illustration shows the booth of the Hilo Varnish Corporation, 42-60 Stewart Ave., Brooklyn, N. Y., which was on exhibition at the Sixth International Heating & Ventilating Show held in Cleveland, Ohio. Smooth, gloss, and semi-gloss, tough, quick-bake type of finishes were used on many of the pieces of equipment exhibited in the booth.

Hilo Rip-pls were used on some of the equipment. This type of finish is de-

View of Hilo booth at Sixth International Heating and Ventilating Show

signed to meet the need of a one-coat finish.

The finishes of greatest interest, as evidenced by many of the exhibits, were the smooth surface, two-tone hammered metal effect, and the new smooth, gloss spatter finishes. Interest of the visitors to the Hilo exhibit booth was centered in these two types of finishes. Hilo Hammerkraft and Vitra-Carlite Spatter are said to meet the need of manufacturers for a smooth, durable finish. Both Hilo Hammerkraft and Vitra-Carlite Spatter are two-spray, one bake finishes.

Harold R. Smallman Appointed Western Manager for Hanson-Van Winkle-Munning Company

Harold R. Smallman, for many years in charge of the Chicago District office of the Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturer of electroplating equipment and supplies, has been made western manager of the Company.

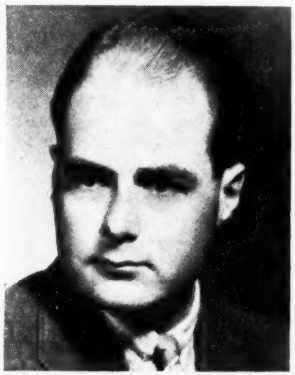
Mr. Smallman's business career embodies a broad experience in the electroplating industry as well as early shop and field training as an electrician. In 1916 he joined the Howe Electric Company of Chicago, remaining with this firm until the War. In 1917 and 1918, he was in the 108th Engineers, 33rd Division, and after his discharge, he rejoined the Howe Electric Company, where he was employed until 1920. He then joined the Armour Company, and one year later, he became associated with A. P. Munning and Company, manufacturer of electroplating equipment and supplies.

Harold R. Smallman

Mr. Smallman has the good wishes of all of the Hanson-Van Winkle-Munning Company and of his many friends throughout the trade in the territory which he has so long served.

Gustavo Sommer Appointed Mexico Representative for American Nickeloid Company

American Nickeloid Company, Peru, Ill., manufacturer of prefinished metals, announces the appointment of Gustavo Sommer, S. A., Mexico City, D. F., to represent their concern in the sale of American bonded prefinished metals in the Republic of Mexico.



Gustavo Sommer

There exists in Mexico a considerable market for these products and this demand is expected to increase as Mexican firms become more familiar with American bonded prefinished metals. Mr. Sommer stocks the metals, sells from a retail store in Mexico City warehouse. He covers the Republic with six salesmen, also issuing an annual catalog of the metal which he handles.

Cosgrove Appointed Director of Development Laboratory for Standard Steel Spring Company

Mr. R. C. Enos, president, Standard Steel Spring Company, Coraopolis, Pa.,

announces the appointment of Mr. J. M. Cosgrove as director of the development laboratory. Mr. Cosgrove will be

J. M. Cosgrove

actively interested in research on the new corrosion proof coating developed by the Company.

Mr. Cosgrove was formerly chief chemist of Noblitt-Sparks Industries, Inc. and before that, process control engineer for the Meaker Company, development engineer in charge of plated finishes for Western Electric Company.

Mr. Cosgrove graduated from the Massachusetts Institute of Technology as an electrochemical engineer. He also has a degree from Manhattan College. He has written a number of papers on cleaning and finishing problems in the coating of metals and is well known in this industry.

DeVilbiss Training School

The DeVilbiss Company, 300 Phillips Ave., Toledo, Ohio, recently announced the schedule of its training school for the first half of 1940. To be held in the Company's Toledo plant, this school is open to industrial painters, master painters, automobile refinishers, and all others interested in learning the technique of spray painting and the use of and care of spray painting equipment.

Each training period lasts for one week. The classes begin on the following dates: March 4th, April 11th, May 6th, and June 3rd.

Special rates in Toledo hotels and boarding houses near the plant have been secured by the Company for men attending the school.

These classes have been well attended in the past because of the facilities for study otherwise unobtainable, offered by the DeVilbiss Laboratories.

It is advisable to enroll in the school as far in advance as possible, since the size of the classes must be limited, and since there will be no training period other than that announced.

Milwaukee A.E.S. to Hold Annual Meeting

The Milwaukee Chapter of the American Electro-Platers Society will hold its annual educational session and dinner dance April 6, 1940, at the Schroeder Hotel, Milwaukee, Wis. Papers to be presented at the educational session are as follows:

"Patents in The Plating Industry" by Gustaf A. Soderberg.

"Some Overlooked Problems in Electroplating" by George B. Hogaboom.

"Cost" by A. J. Hermansen.

O. Hommel Co. Employees Receive Awards

The O. Hommel Co., following an annual custom, recently awarded service emblems to eleven of their employees who have served their company five years or longer.

The presentation was made in the executive offices at the O. Hommel plant in Carnegie, Pa., by Mr. O. Hommel, president of the O. Hommel Co.

In presenting the emblem of service, Mr. Hommel stressed the importance of having a spirit of cooperation and closely knit friendship, which he feels is of paramount importance in the successful operation of his business.

Mr. Hommel paid homage to the older members — some of whom have been with him for twenty years or longer— and expressed a desire that the younger employees would follow the example of the older men and carry on the tradition that his organization be one large family.

C. M. Rice Represents Bakelite in Cleveland

An announcement has been made that Charles M. Rice, sales engineer for the paint and varnish resin division of Bakelite Corporation, 247 Park Ave., New York, N. Y., has been transferred from New York City to the Cleveland office located at 7016 Euclid Avenue.

Dr. A. Lloyd Taylor Joins Oakite

Expanding its chemical research facilities and services, Oakite Products, Inc., 20 Thames St., New York, N. Y., manufacturer of industrial cleaning materials since 1909, announces the appointment of Dr. A. Lloyd Taylor to its technical staff.

Because of his extensive activities in the field of industrial chemistry where

Dr. A. Lloyd Taylor

he has directed numerous projects covering a wide range of industries, Dr. Taylor brings to his new post a wealth of experience. Having resigned his previous position as director of the Department of Chemistry of Pease Laboratories, New York City, with whom he has been associated for the past six years, he will concentrate his attention primarily on chemical research and development of cleaning materials for production and related cleaning operations of major industries.

Dr. Taylor will also devote part of his time to technical field service, cooperated with the men comprising Oakite's nation-wide service organization in the application of the different specialized cleaning materials originated and developed by the Company during the past 30 years and now widely used in numerous product processing and plant maintenance operations.

Dr. Taylor will be located at the Company's general office, 20 Thames St., New York, where the research and service laboratories of the Oakite chemical and mechanical divisions are maintained.

Porcelain Enamel & Manufacturing Company Appoints William Jackson Sales Representative

The Porcelain Enamel & Manufacturing Company, Eastern and Pemco Aves., Baltimore, Md., announces the appointment of Mr. William Jackson as district sales representative in the Detroit territory of the company, which comprises Michigan, Northern Indiana, and Northwestern Ohio.

Mr. Jackson was formerly porcelain enamel consultant for the Republic Steel Corporation, Youngstown, Ohio, with whom he has been associated for the last six years. Mr. Jackson has been connected with the porcelain enameling industry for over fifteen years, and during this period has gained wide experience in practical porcelain enameling production, having worked in close cooperation with the steel, range, refrigerator, automotive, jobbing, and architectural porcelain enameling industries. He is particularly qualified to advise regarding special applications.

Pearce Appointed Sales Manager of Ferbert-Schorndorfer

David Andrew, president, The Ferbert-Schorndorfer Company, Cleveland, Ohio, has announced the appointment of M. J. Pearce as sales manager.

Mr. Pearce has been actively engaged in industrial sales for the past 19 years. He became associated with The Glidden Company at their Cleveland headquarters in 1920, upon his graduation from the University of Illinois, as a chemical engineer. Until 1928 he remained in Cleveland in charge of the Technical Division of the Industrial Sales Department. He then became sales manager of the Chicago division of The Glidden Company, where he remained until 1931.

In August, 1931, Mr. Pearce was transferred to Reading, Pa., to reorganize the eastern industrial activities of The Glidden Company, remaining there as Eastern Direct Sales Manager until the close of 1938 when he was transferred to Chicago as director of technical service for the entire company.

Scaife Fellowship at Mellon Institute

According to a recent announcement, Wm. B. Scaife & Sons Company, Pitts-

burgh, Pa., has established an industrial fellowship at Mellon Institute for the purpose of conducting scientific research on problems pertaining to processes of fabricating and to the use of metal tanks, pressure cylinders, and water-softening equipment. The investigation work will be in accordance with the company's desire to keep closely informed regarding all technical progress in its own and related fields, with special attention to present and probable future trade requirements, and to effect through research and development all possible improvements in its production practice as well as in its products.

Dr. H. L. Anthony, III, who is the incumbent of this fellowship on metal-working, received his professional metallurgical education at Lafayette College, University of Alabama, and Harvard University. In his researches in Mellon Institute, he will have the advisory collaboration of metallurgical and engineering specialists there and in the fellowship donor's organization.

A. C. Cooper to Handle Lo-Hed Monorail Electric Hoists

American Engineering Company, Philadelphia, Pa., manufacturers of Lo-Hed Monorail Electric Hoists, announces the appointment of A. C. Cooper Sales Company, 220 East 42nd St., New York City, as sales representatives for metropolitan New York, Long Island, and Northern New Jersey. A. C. Cooper Sales Company specializes in the selling of materials handling equipment. Mr. Julian Florandin is now associated with the company.

George Koch Sons, Inc. Appointed Agents for DeBothezat

American Machine and Metals, Inc., East Moline, Ill., has announced the appointment of George Koch Sons, Inc., as exclusive agents in Evansville, Ind., for their line of DeBothezat ventilating equipment.

Westbrook Appointed Research Manager of Electroplating Division

L. R. Westbrook, formerly assistant director of the Cleveland, Ohio, Experimental Laboratory of the Grasselli Chemicals Department, E. I. du Pont de Nemours & Company, Wilmington, Del., has been appointed research manager of the Company's Electroplating Division. In his new position, Mr. Westbrook assumes charge of all electroplating research activities of the du Pont Company. He will continue residence in Cleveland.

Eaton-Clark Appointed Distributors of Cowles Metal Cleaners

Colonel A. L. Mercer, president, and Mr. H. L. Trembicki, manager of the Metal Cleaning Department of the Cowles Detergent Company, 10525 Carnegie Ave., Cleveland, Ohio, are pleased to announce the appointment of the Eaton-Clark Company, 1490 Franklin St., Detroit, Mich., as distributors of Cowles Anhydrous Metal Cleaners. The Eaton-Clark Company will maintain a complete stock of Cowles Cleaners in their Detroit warehouse and will ship to all points in Michigan. Mr. F. H. Hitchcock, Cowles salesman, will work closely with the Eaton-Clark organization and will render any service necessary. Through their connection, Cowles expects to perfect its distribution and service to the industry.

Lea Establishes Research and Technical Development Department

The Lea Mfg. Co., Waterbury, Conn., announces the establishment of a research and technical development department for the cutlery industry. The work will be under the direction of specialists in finishing in this branch of metal-working, namely, Edwin C. Jarm, formerly with The Carborundum Co., and William D. Starr, technical director of The Lea Mfg. Co.

Steel Heddle Enlarges Hard Chromium Plating Division

In order to keep up with the greatly increased demand for a special grade of hard chromium plating, the Steel Heddle Mfg. Co., with plants in Philadelphia, Greenville, S. C., Atlanta, Ga., and Montreal, Canada, has found it necessary to more than triple this division in the Philadelphia plant, which is located at 2100 W. Allegheny Avenue.

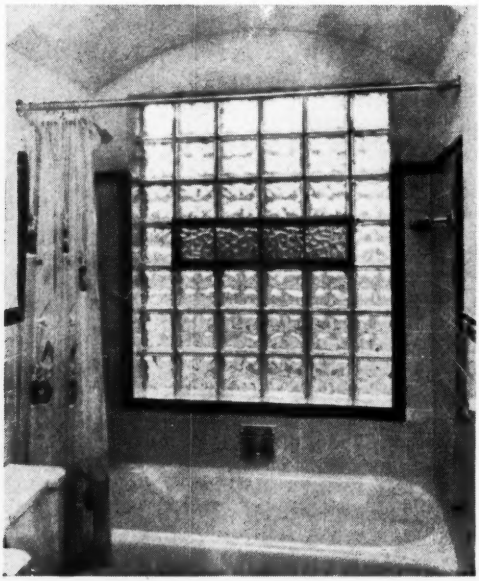
Mention PRODUCTS FINISHING when writing to advertisers.

Finishes THAT AID IN APPEARANCE AND UTILITY

(Photo Courtesy Designers for Industry, Inc.)

(Right) — A wrinkle finish plus band edges of hard, smooth enamel provide a smart, durable "dress" for this Super-Speed streamlined typewriter.

(Photo Courtesy The American Rolling Mill Co.)



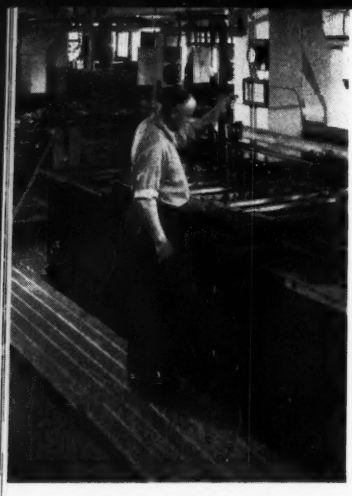
(Left) — A window ventilator which offers a solution to the problem of obtaining adequate fresh air in rooms where glass block is a part of the wall structure is shown here. This unit is made of stainless steel and is provided with a rustproof, insect-proof screen.

(Right)—This rubber plate vulcanizer is designed for functional rigidity and accurate performance. It is coated with a finish that resists abrasion and wear.

(Photo Courtesy Lake Erie Engineering Corp.)

(Below)—An airport service truck designed and finished to conform with airline speed and beauty. Fourteen gage H.T.-50 sheet steel is used in the fabrication of the body. After assembly, the body is sprayed with red enamel.

(Photo Courtesy Standard Steel Works)



New PLANT EQUIPMENT AND Materials

Hanson-Van Winkle-Munning Buffing Lathe Type MO

A buffing lathe, to be known as the "Type MO," has been designed for a range of work not requiring a heavy duty machine and has been placed on the market by Hanson-Van Winkle-Munning Co., Matawan, N. J. As shown in the illustration, an overhang for clearance is furnished.

The body of the Type MO Buffing Lathe is a heavy one-piece iron casting and the base dimensions are 24 in. wide by 20 in. deep. Drive is by means of a V-belt, with quick belt changing as a special feature. Any spindle speed from 1,800 to 3,600 r.p.m. can be obtained and other speeds are available by changing the motor sheave pulley. The spindle is constructed of 1¼ in. to 1¾ in. alloy steel.

The Type MO Buffing Lathe is furnished for 220, 440, and 550 volts, two or three phase, 60 cycle, A.C. power circuit. This lathe is also furnished for special or other A.C. or D.C. circuits.

Hanson-Van Winkle-Munning Buffing Lathe Type MO

Electro Lift Aluminum Hoist

A light weight, high speed, cable type electric hoist with castings of aluminum alloy is now being marketed by Electro Lift, Inc., 30 Church St., New York, N. Y. The manufacturer states that the hoist has been designed for the lightest possible weight consistent with the heavy duty service for which the hoist may be used. The light weight feature is said to make the hoist particularly suitable for applications requiring frequent moving and handling. The non-corrosive properties of the aluminum alloy also make it particularly suitable for use in steam and acid fumes.

The Electro Lift Aluminum Hoist is built in sizes from ⅛ ton to 3 tons and has all of the speeds and ratings of standard Electro Lift Hoists.

Sprayit Series 500 Paint Spraying Unit

A portable paint spraying unit with twin diaphragm cylinder compressor for

fast painting performance, to be known as the "Sprayit Series 500" Paint Spraying Unit, has been placed on the market by The Electric Sprayit Co., Sheboygan, Wis. This unit is designed for general maintenance painting in factories and finishing departments.

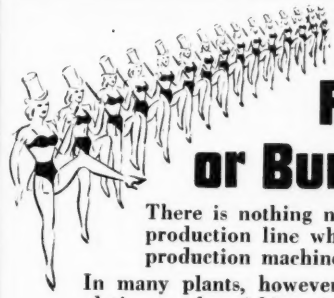
The compressor is streamlined and attractively finished in silver and red and is mounted on a heavy sheet steel base with four 2½ in. diameter rubber tired casters and is V-belt driven by either a ½ H.P. electric motor or a ⅝ H. P. gasoline engine. The opposed connecting rods are said to assure perfect balance and freedom from vibration during operation. The compressed air is entirely without pulsation.

The diaphragm type compressor seals off the crankcase from the cylinder head and assures oil-free air. The compressor displacement is 5.10 C.F.M. and the spraying pressure is 40 pounds.

The spray gun, which is of the pressure feed, internal mixing type, is furnished complete with round and fan spray nozzles, as well as with an angle nozzle for spraying ceilings and other points which could not otherwise be reached without tipping the gun. The gun body and container cover are of die cast aluminum and the quart cup is also aluminum. The nozzles and fluid tip are of hardened steel to assure trouble-free performance over a long period of time.

Sprayit Series 500 Paint Spraying Unit

The Sprayit Series 500 Paint Spraying Units are furnished either with or without the ½ H.P. motor or ⅝ H.P. gasoline engine.



Is Your Cleaning, Rinsing and Drying, or Burnishing *Out of Step?*

There is nothing nicer to watch than a well trained Chorus, or a production line where everything is in step—handled by modern production machinery.

In many plants, however, metal cleaning, or rinsing and drying after plating, or burnishing, is out of step, causing delays and keeping costs up, because of old fashioned machinery.

Ransohoff has designed Washers, Rinsers and Dryers, Sawdust Dryers and Burnishing Barrels that are modern production machines. They fit in, and keep step with any other production machinery. They improve product, speed production, reduce costs and pay for themselves quickly.

Write for information about the latest machines, or for a Ransohoff Engineer to look over your plant and make suggestions.

N. RANSOHOFF, INC.

212 W. 7lst St. Cincinnati, Ohio

Rexvane Vent Sets

A general purpose blower or exhauster for general ventilating, air conditioning, and fume exhaust has been recently developed by B. F. Sturtevant Company, Hyde Park, Boston, Mass. Known as

Rexvane Vent Set

Rexvane Vent Sets, these fans are of the centrifugal type with direct connected motor. The central feature is the radial blade fan rotor which permits higher rotative speeds, lower outlet velocities and more dependable balance when handling air which contains grease or solid particles. Cone-shaped inlets guide the entering air to the rotor with a minimum shock and turbulence and consequent reduction in noise.

The rotor consists of eight blades, each of which is curved into the inlet in the direction of rotation. This design greatly increases the volume of air handled. The curved portions of the blades are banded together by a broad hoop which strengthens the rotor and also streamlines the path of the entering air. The blades are assembled on the drive side to a steel backplate and cast iron hub. Rotors are balanced both statically and dynamically to eliminate vibration. The rotor is mounted on the motor shaft, eliminating the necessity of intermediate bearings.

Motors are of N.E.M.A. specifications of 40 degs. centigrade type, amply powered to carry maximum fan load without danger of overheating or overloading. Nine sizes of Rexvane Vent Sets are available with rotors ranging from 6 in. to 24 in. in diameter.

Roche Single Diaphragm Paint Spray Unit

A single diaphragm paint spray unit for light jobs requiring small, inexpensive paint spray equipment to be known as the "New Roche" has been placed on the market by Binks Manufacturing Company, 3114-40 Carroll Ave., Chicago, Ill. The compressor of this new unit delivers 2.2 c.f.m. at 26 lbs. working pressure to a new, specially designed Roche "J" Gun.

The Roche "J" Gun is said to handle all kinds of average viscosity paints, enamels, lacquers, varnishes, and so on. A piston type compressor for the New Roche unit is also available.

Paisley Metal Protecting Compound

A metal protecting compound to be used in conjunction with ordinary wrapping papers for the protection of stainless steel sheets and materials during storage, fabrication and shipping has been announced by Paisley Products, Inc., 1770 Canalport Ave., Chicago, Ill.

According to the manufacturer, Paisley compound is brushed on the metal and the paper is spread over the coating. The paper may be coated and smoothed onto the metal. It is claimed that the paper will lay perfectly smooth, effectively sealing the metal against abrasion and scratches during handling.

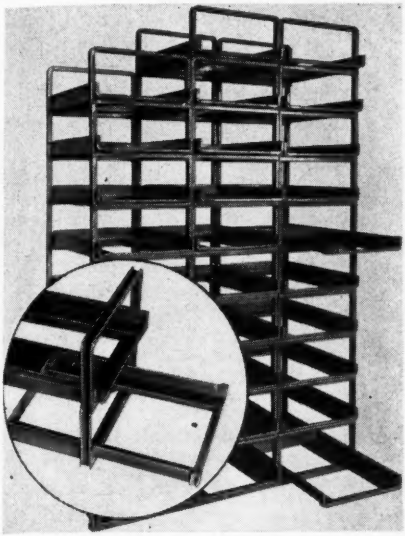
To remove the paper and compound, the Paisley compound can be simply washed off with warm water.

Roller Bearing Stackrack

One of the newest developments of Stackbin Corporation, to be known as

LEADING MANUFACTURERS
***Specify* SAUEREISEN ACID PROOF CEMENT**
for pickling tanks, stacks, foundations, etc.
SAUEREISEN CEMENTS CO. *Write for catalog.* Pittsburgh 15, Pa.

"Roller Bearing Stackracks," has been placed on the market by Stackbin Corporation, 92 Troy St., Providence, R. I. Stackracks are patented interlocking units of channel and formed steel which set up to form box storage racks of any height, size, or capacity. To these Stack-



Roller Bearing Stackrack

racks has been added a roller bearing slide which is said to make the handling of the heaviest boxes easy and safe.

The roller bearings fit into the channel steel of the slide in such a way that the sliding motion of the box is restricted to one-half its length. The upper surfaces of the slides are made smooth to make it easy to insert or remove the boxes.

Designed particularly for those plants where heavy stock and materials stored in boxes must be readily accessible, the addition of the roller bearing slide makes it a fingertip job to reach the contents of boxes piled in Stackracks regardless of the size or weight of the loaded box. The Roller Bearing Stackracks are made in sizes to fit any plant's boxes or pans.

M. S. A. Faceshield

Mine Safety Appliances Company, Braddock, Thomas and Meade Sts., Pittsburgh, Pa., recently announced the

DU-LITE
Process "290"

What it is

A chemical reaction at 290° F. on tool steel, high-speed, carburized parts and plain cold-rolled steel.

What it does

Produces a rich, heavy, permanent black finish that will not rub off.

Neither hardens nor draws, adds nothing to any dimension, deposits no dirt or film in threads or other surfaces, does not embrittle. Solution washes off freely in cold water.

DU-LITE is a low cost, decorative and protective finish that reduces finishing costs as much as 66% and gun finishing time as much as 3 hours.

Send samples for processing or write for descriptive literature.

DU-LITE CHEMICAL CORP.
HIGHLAND AVE., MIDDLETOWN, CONN.

development of a newly designed and constructed faceshield. This faceshield, which is intended for use on jobs where goggles are not absolutely required has been designated as the M. S. A.

The M. S. A. Faceshield is said to afford comfortable protection against chemical splashing, flying grit and dust, and so on. Preformed head gear, which conforms to the natural contours of the back of the wearer's head, is a feature of the M. S. A. Faceshield. Additional features are said to be the light weight of the shield, a three-way, full headgear adjustment, finger control of friction adjustment permitting easy visor movement, and the aluminum binding of visor edge which extends around the entire edge and is said to greatly increase durability.

The visor, which may be pushed upward and back on top of the head at will, is claimed to be made of the best commercially available plastic in four-inch, six-inch, and eight-inch size, in green as well as clear. The head gear is constructed of moisture-resistant fibre and the sweatbands are made of genuine leather.

M. S. A. Faceshield

A. O. C. No. 303 Super Duralite-50 Safety Goggle

American Optical Company, Southbridge, Mass., has placed on the market a No. 303 Super Duralite-50 Safety Goggle with a non-rubber headband. The eyecups are molded from a special material that is said to combine light weight for comfort with high tensile strength for long wear. This material is said to be unaffected by exposure to water, oil, grease, and perspiration. The eyecups can be sterilized without harm. Anatomically designed, the eyecups have broad bearing surfaces and are low set to provide wide angle vision.

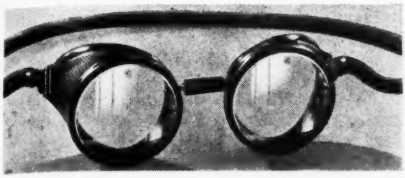
APPROVED* *for Safety*
DEMANDED *for Comfort*
THE M. S. A.
ABRASIVE MASK

Lightweight and comfortable; unhampered working freedom and great durability combine with *complete protection* to make this famous Mask preferred by shot and sandblast operators everywhere! Write for the story of its exclusive features: Bulletin CS-3.

*U. S. Bureau of Mines Approval No. 1907.

MINE SAFETY APPLIANCES CO.
BRADDOCK, THOMAS & MEADE STREETS: PITTSBURGH, PA.
DISTRICT REPRESENTATIVES IN PRINCIPAL CITIES

WRITE FOR LATEST CATALOGUE ON
NEW LOW COST PLATING
with HOBART Electroplating Equipment
HOBART BROS. CO., Box PF-340 Troy, Ohio, U.S.A.



A. O. C. No. 303 Super Duralite-50 Safety Goggle

The non-rubber headband consists of a spring and ball chain covered by a cloth sleeving. The chain prevents over extension of the spring, yet permits instant adjustment to any desired head size. When adjusted, the non-rubber headband is said to retain the same tension indefinitely.

Standard lenses supplied are the 6.00 curve clear Super Armorplate type. The caps which hold the lenses in place are precision threaded to insure easy removal for replacement of lenses. Metal screens provide adequate ventilation.

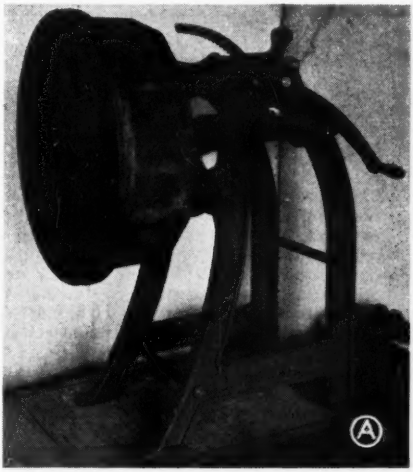
Tempils

A unique technique in temperature control to be known as "Tempils" has been placed on the market by Tempil Corporation, 132 West 22nd St., New York City. Tempil technique is said to be simple. In application, Tempils are merely placed upon or against a heated object. When the Tempil melts, the heated object has reached the temperature stated on the Tempil.

Tempil pellets have a sharp and rapid melting action at a stated temperature. Thus, Tempil 200 melts at 200 degs. F., Tempil 300 melts at 300 degs. F., and so on. The Tempil pellets are not corrosive to metals and do not pit or leave objectionable stains which cannot be easily removed. The pellets are available in whole hundred degree ranges of 200 degs., 300 degs., 400 degs. F. and so on, and on request, are also available in 50 deg. F. intervals. Tempils are especially valuable in determining temperatures in the black heat range.

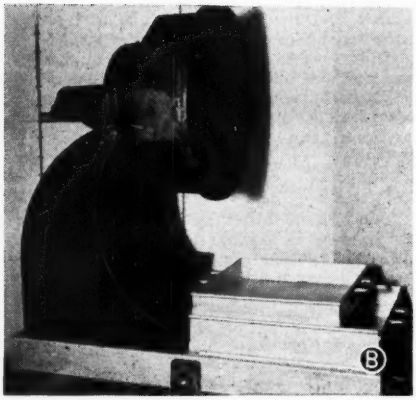
Baird Tumbling Barrel

The Baird Machine Company, Stratford Ave., Bridgeport, Conn., has placed on the market a newly designed leg type tilting tumbler which is said to be simple in construction. The construction of the unit is also said to permit a better arrangement for motor drive for this type of machine. This machine is known as the high and narrow type of



Baird Leg Type Tilting Tumbler

HAMMOND
POLISHING MACHINES
POLISHING LATHES ★ . . . Ask for Catalog No. 10.
AUTOMATICS ★ . . . Rotary and Strait-Line. Send samples for prices and approximate production figures.
Hammond Machinery Builders
INCORPORATED
NEW YORK
1622 Douglas Ave., KALAMAZOO, MICH.
CHICAGO



Baird Pedestal Type Tilting Tumbler

tumbling barrel. The unit shown herewith in the illustration designated as A is of cast iron and the front end is said to be easily removable. An opening is also provided at one side.

The unit shown can be used unlined for rolling in an abrasive such as sand, silicate, and so on, or the barrel is available with wood linings in the sides and used for ball burnishing. This type of barrel is also available constructed of sheet steel.

The illustration designated as B shows another application of the high and narrow type barrel. This barrel is lined with wood on the inside. The unit is provided with a scoop so that as the work is emptied from the barrel it can be directed into the upper tray which is shown beneath the unit. The tray has a sieve in the bottom which permits the burnishing material to fall into a lower tray and thus separate from the work.

Ipco Neoprene Suit

The illustration shows the Ipco Neoprene Oil and Acid Suit which has been placed on the market by Industrial Products Co., 2805 North 8th St., Philadelphia, Pa. The suit is made from DuPont Neoprene synthetic rubber, and according to the manufacturer, hot or cold oils, gasoline, naphtha, hot or cold caustic soda, tannic, muriatic, or hydrochloric acid have little or no effect on the material. The suit is also said to be

Ipco Neoprene Suit

METAL BASKETS
of all kinds

Specialists in manufacturing of cleaning baskets where air circulation and drainage are the essential features. Fabricated from any metal, in any style, size or shape for industrial requirements, such as cleaning, plating, finishing, pickling, *heat treating*, etc. Write for catalog.

THE CARPENTER METAL PROD. CO.
445 EAST 131 ST. • CLEVELAND, O.

For a real good polishing job use
KEYSTONE EMERY
TURKISH — NAXOS — AMERICAN
KEYSTONE EMERY MILLS *Write for Sample* 4316 Paul St., Phila, Pa.

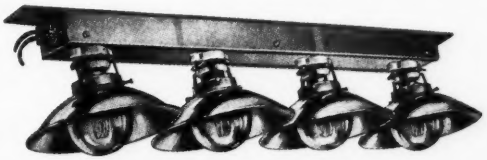
resistant to the effects of air and sunlight.

The Ipco Neoprene Suit is manufactured in the two-piece style as illustrated with all seams vulcanized. The jacket has square shoulders, low stand-up collar, and ball and socket snap fasteners with protecting fly front. Pants are of the bib type with adjustable suspenders of the same material. Standard coat length is 29 in. and pants inseam 30 in. The chest measurement of coat and waist measurement of pants are available in small, medium, and large sizes of 46, 50, and 54 in. respectively for the coat and 38, 42, and 46 in. respectively for the pants.

Units for Infra-Red Ray Drying

North American Electric Lamp Co., 1020 Tyler St., St. Louis, Mo., has placed on the market standard units of light banks for drying, heating, and dehydrating with radiant energy. These units are available completely assembled with from three to eight lights per unit. A four-light bank is shown in the illustration herewith.

Nalco Light Banks, as the standard units are known, are furnished complete with lights, reflectors, and porcelain sockets mounted on rigid conduit. The units are equipped with 12½ ft. of approved rubber cord and plug, ready for immediate use.



Nalco Four-Light Infra-Red Ray Light Bank

Individual light reflectors are also available for mounting and assembling as required.

Paasche Automatic Air Coating and Drying Unit

Paasche Airbrush Co., 1910 Diversey Parkway, Chicago, Ill., has placed on

AA QUALITY ABRASIVES

QUALITY ABRASIVES FOR POLISHING AND BURNISHING

ALUMINUM OXIDE ● SILICON CARBIDE ● CORUNDUM ● TURKISH EMERY ●

Selected ores carefully cleaned and graded to give you better polishing and burnishing performance.

For attractive prices and prompt service write to—

AMERICAN ABRASIVE COMPANY
WESTFIELD ● MASSACHUSETTS

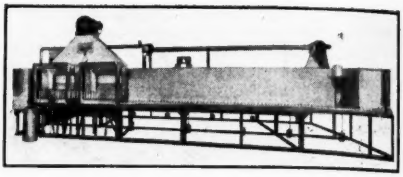
KING PLATING BARRELS

Write for illustrated folder.
Use them once—you'll use them always
JOHN KING
48 SPRINGFIELD ST., DAYTON, OHIO

the market an automatic air finishing and drying unit designed for enameling flashlight cases and similar items up to 18 in. in length and baking the finish at temperatures ranging from 200 degs. to 400 degs. F. The conveyor is equipped with 1,605 revolving spindle assemblies mounted at 2½ in. centers and the speed of the conveyor is controlled to conform to any drying cycle required.

The drying oven is built in two sections to provide 200 degs. temperature in the first section and 400 degs. F. in the second section, with five minutes allowed for forced cooling after the pieces leave the oven. On a drying cycle of five minutes in the 200 degs. section, 15 minutes in the 400 degs. section, and five minutes force cooling, the speed of the conveyor is regulated to produce 52½ finished pieces per minute. The oven unit is insulated with 3-in. rock wool and is electrically heated and thermostatically controlled. Removable tops are provided for easy access to the interior of the oven and 75 per cent of the bottom area of the oven is equipped with counter weighted doors to insure against explosion hazards.

The coating section is equipped with two spray booths, one for automatic operation and the other for manual or experimental purposes. This unique feature increases the value and utility of the unit as it serves the dual purpose of a complete production unit plus the added feature of adapting it for experimental and new development work.



Paasche Automatic Air Coating and Drying Unit

Overall dimensions of the conveyor are 35 ft. long x 11 ft. wide with approximately 336 ft. of steel roller chain mounted on ball bearing sprockets and equipped with ball bearing chain take-up.

Borolon
TRADE MARK

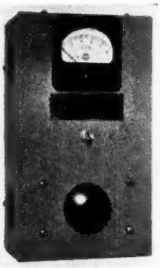
First quality aluminum oxide abrasive grain manufactured in our own electric furnace plant under strictest standards of quality and uniformity. Available in four types (CT, T, B, TB), each of which is most efficient for polishing work within its field of application. Write for Abrasive Grain Data Sheet No. 1 giving complete details. Samples sent of grain sizes you specify.

POLISHING GRAIN

ABRASIVE COMPANY
Division of Simonds Saw and Steel Company
Tacony & Fraley Streets • Philadelphia, Pa.
Chicago Branch: 1624 South Western Ave.

Selectro-Plater

A source of power for electroplating, to be known as the "Selectro-Plater," has been placed on the market by The W. Green Electric Co., Inc., 192 Broadway, New York, N. Y. This unit will deliver 7½ volts at 4 amperes on continuous load and will give over 8 amperes on intermittent load or flash plating. This unit operates on alternating current only, at line voltages of 105, 110, and 125 volts.



Selectro-Plater

The Selectro-Plater is a complete functioning unit, sturdy, compact, and light

in weight. The dimensions are approximately 10 x 6 x 5 in. and the weight is approximately 10 pounds. The unit is designed particularly for jewelers, dental laboratories, small plating plants, experimental laboratories, and small plating rush work in large commercial plants.

In order to plate, the Selectro-Plater can be plugged into any A.C. electric outlet, and the cathode and anode leads connected to the binding posts and plate. A single knob variable control on the panel enables the plater to adjust the voltage from zero to the maximum voltage as measured by a panel voltmeter.

The Selectro-Plater is said to be ruggedly built to do professional work and is a reliable, accurate, and flexible power source for electrodeposition.

Deoxylyte

An inhibited acid for use in connection with pickling and cleaning ferrous metals, to be known as "Deoxylyte," has been placed on the market by American Chemical Paint Company, Box 303, Ambler, Pa. This material is said to fit into the manufacture and finishing of steel products from the steel mill to the paint room.

Deoxylyte is said to remove light rust from surfaces that are oil-free and to eradicate any rust-stimulators on the metal. It can be used in concentrations ranging from ¼ to 2 per cent by volume of a bath in which the metal parts are immersed for about 15 to 30 seconds. The parts can then be thoroughly rinsed in cold water and finally in boiling water containing .01 to .02 per cent of Deoxylyte.

Deoxylyte can be used in the final rinse stage of alkali cleaning operations, where it can be employed in concentrations of from .01 to .02 per cent of the volume. In this case, it is said to serve the purpose of precipitating and neutralizing sulphates and carbonates in the rinse water.

Deoxylyte is said to act less rapidly on steel processing tanks due to the fact that it is an inhibited acid.

Pulmosan Eyeshield-Respirator

An eyeshield-respirator has been developed and is now being marketed by Pulmosan Safety Equipment Corp., 176

R-700

An unusual Rust Inhibitive.
Dries with lacquer speed.
Very flexible baking schedule.
Resists salt spray remarkably.
Very light in color.
Ideal vehicle for bronze powders and pastes.
Suggested wherever RUST is a production problem.
Remarkably adherent as primer under baked finishes.
Variations for special requirements available.
Our pamphlet will be gladly sent on request.

The Varnish Products Co.
5208 HARVARD AVENUE
CLEVELAND, OHIO

THESE TWO

Prepare Metals for Painting

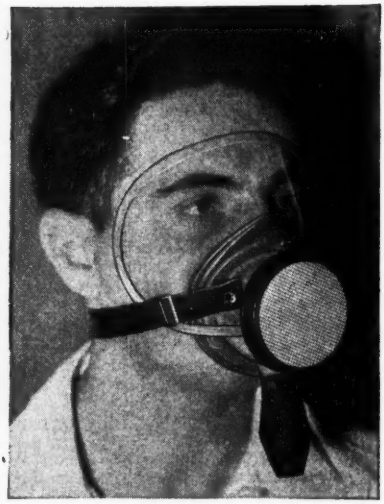
DEOXIDINE cleans and prepares metal surfaces perfectly for painting. Neutralizes rust-producers.

LITHOFORM No. 2 keeps paint intact and lustrous on zinc and cadmium surfaces.

Write for bulletins.

AMERICAN CHEMICAL PAINT CO.
Box 303, Ambler, Penna.

Johnson St., Brooklyn, N. Y. This eyeshield-respirator is said to combine the eye protection of a plastic eyeshield with



Pulmosan Eyeshield-Respirator

the breathing protection of a respirator and is said to be valuable in conditions of dust, splashing, or flying particles.

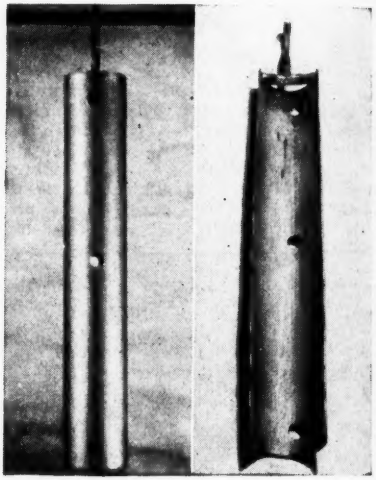
The eyeshield is of a clear plastic which weighs one-half ounce. It is arched over the respirator and held in place by means of headband snaps. Snug, comfortable protection is afforded without pressure points on the face. Full and unobstructed vision is assured. The construction is said to prevent the shield from flapping, bending, or twisting. It can be easily removed for cleaning.

The complete eyeshield-respirator assembly is available in several Pulmosan respirator models. The eyeshields are available separately for Pulmosan respirators now in use.

Acme Tubular Lead Anode for Chromium Plating

A tubular lead anode designed to give unusually even throwing power and low resistance for the current discharge surface available is now being marketed by Acme Lead-Burning Company, 3726 West 73rd St., Cleveland, Ohio.

The Acme Tubular Anode is available in either pure lead or 6 per cent anti-



Acme Tubular Lead Anodes for Chromium Plating

"INDIAN BRAND"
Turkish and Naxos Emery

Made only from select grades of ore—accurately graded and thoroughly cleaned. Prompt shipment on every order. Cuts cleaner—cuts faster.
Write for trial lot.
HAMILTON
EMERY & CORUNDUM CO.
CHESTER • MASS.

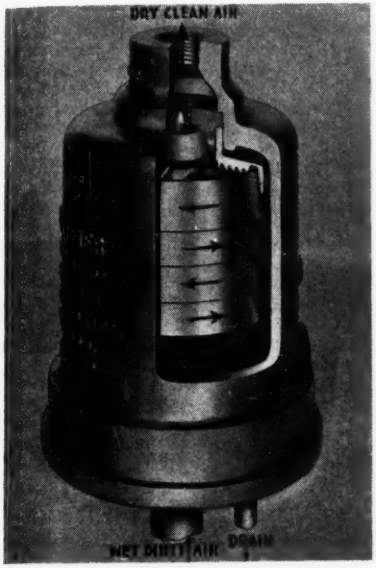
"HECCO BRAND"
American Emery

monial, according to specifications. The Acme Tubular Lead Anode is particularly recommended for the center anode busbars of a tank due to the fact that it provides equal current distribution on all sides. For the anodes of the side busbars, a semi-circular pattern is recommended.

Logan Aridifier

The Logan Aridifier shown in the illustration is one of a line of aridifiers in sizes from ⅜ to 10 in. which has been brought out by the Logan Engineering Co., 4912 Lawrence Ave., Chicago, Ill. The aridifier is simple in construction and is said to be easily installed in any interior or exterior line. According to the manufacturer, it operates without back pressure and requires no maintenance or attention other than a periodical clean-out. The aridifier is designed for application to all compressed air lines in foundries such as sand blast equipment, jolt machines, strip, draw, and roll-over equipment, shake-outs, air-driven chippers, hammers, and grinders, and so on.

In operation, foreign matter is impinged on a multiplicity of propeller blades revolving in opposite directions and propelled by the flow of air or gas. The collected contamination and moisture is deposited in the lower housing from where it is drawn off as occasion warrants.



Logan Aridifier

Stow Combination Flexible Shaft Machine

The Stow Manufacturing Co., Inc., Binghamton, N. Y., has placed on the market a "Combination" Flexible Shaft Machine. This model, to be known as

RUST-I-CIDE "50"
Cleans, etches, and prepares metal for a perfect finishing job.
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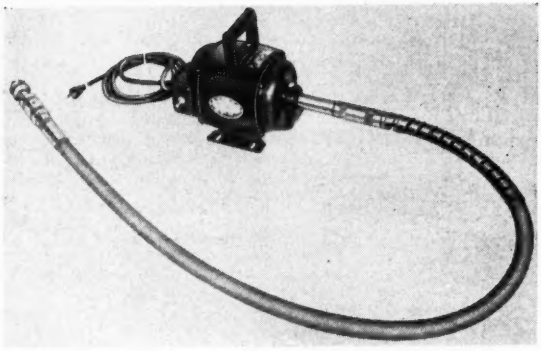

Stow "Combination" Flexible Shaft Machine

the "AJ," consists of a motor, flexible shaft, clamp spindle, and extension cord and plug.

The Model AJ will be part of the Junior line of flexible shaft machines manufactured by this company. The Combination Model is for both bench and portable use, being fitted with a conventional base and also with a carrying handle.

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Kemick Bulletin. A bulletin describing "Kemick," a chemical paint that is said to stay put on heated metals, is now being issued by American Chemical Paint Company, Box 303, Ambler, Pa. One of the applications of Kemick recommended by the manufacturer is the coating of automobile engine exhaust manifolds, exhaust pipes, and mufflers.

When heated, Kemick is said to part-

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A copy of this bulletin will be sent free upon request.

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4. Ventilating By Air Movement

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5. Rome Polishing and Buffing Lathes

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Index TO ADVERTISEMENTS

Abrasive Company 72
Abrasive Products, Inc. 45
American Abrasive Company 71
American Chemical Paint Company 73
American Manufacturing Concern 77
Ault & Wiborg Corporation 11

Barton Mines Corporation 75
Binks Manufacturing Company 28-29

Carborundum Company, The 17
Carpenter Metal Products Co. 70
Continental Roll & Steel Foundry Co. 25

Detroit Rex Products Co. ..... Fourth Cover
De Vilbiss Company, The 13
DeWitt Hotels, Inc. 76
Du-Lite Chemical Corp. 67
Duriron Company, Inc., The 35

Egyptian Lacquer Mfg. Co. 6

Ford Sales Company, The J. B. 33

Hamilton Emery & Corundum Co., The 74
Hammond Machinery Builders, Inc. 69
Hanson-Van Winkle-Munning Company 55
Heatbath Corporation 31
Hilo Varnish Corporation 3
Hobart Bros. Co. 68
Hovey Spray Equipment Co. 77

International Nickel Company, The 8

Jackson Buff Corporation 40-41

Keystone Emery Mills 70
King, John 71
Kirk & Blum Mfg. Co., The 4

Magnus Chemical Company 37
Mahon Company, The R. C. 21
Michigan Buff Co., Inc. 77
Michigan Chrome Company 23
Mine Safety Appliances Co. 68
Motor Repair & Mfg. Co., The 77

Norton Company 49

Oakite Products, Inc. 1

Paasche Airbrush Company 2
Pennsylvania Salt Manufacturing Co. 5
Philadelphia Quartz Company 39
Polk & Co., R. L. 76

Ransohoff Inc., N. 65
Ross Engineering Corp., J. O. ..... Third Cover
Roxalin Flexible Lacquer Co., Inc. ..... Second Cover
Rusticide Products Company 75

Sauereisen Cements Co. 66

Udylite Corporation, The 43

Varnish Products Co., The 73

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